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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 6, NUMBER 20
OCTOBER 15, 1973

W73-12351 -- W73-13000

U.S. DEPARTMENT OF THE INTERIOR
OFFICE OF WATER RESOURCES RESEARCH
WATER RESOURCES SCIENTIFIC INFORMATION CENTER

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Deoartment of the Interior

VOLUME 6, NUMBER 20
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The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

SOVIET STUDY SHOWS POLYWATER DOESN'T EXIST.
Chemical and Engineering News, Vol 51, No 29, p 13-14, July 16, 1973.

Descriptors: *Water chemistry, *Capillary water, Physical properties, Chemical properties, Capillary action, Cohesion, Adhesion, Molecular structure, *Silicates, Water types, Aqueous solutions, Foreign research.
Identifiers: *Polywater, Soviet Union.

The controversy over the existence of 'polywater' (also called 'water II', 'anomalous water', 'orthowater', or 'superwater') has been terminated by its primary originator and chief investigator, Dr. Boris V. Derjaguin (Deryagin) of the Institute of Physical Chemistry of the USSR Academy of Sciences. In a critical review article on world-wide research activities on polywater, titled 'The state-of-the-arts in liquids' modification by condensation', published in 'Recent Advances in Adhesion' (Lieng-Huang Lee, editor; Gordon and Breach, New York and London, 1973), the anomalous behavior of water II is admitted by Derjaguin to be due to impurities, notably silicates leached from the quartz walls of capillary tubes in which anomalous water has to be prepared by condensation. Recent experimental evidence refuting the hypothesis of anomalous polymeric water is mentioned. (Brown-TPC)
W73-12540

02. WATER CYCLE

2A. General

HYDROLOGICAL YEAR-BOOK OF ISRAEL, 1970/71.
Ministry of Agriculture, Jerusalem (Israel). Water Commission.

Hydrological Service Publication, 1972. 161 p.

Descriptors: *Hydrologic data, *Surface waters, *Groundwater, *Hydrologic systems, Foreign countries, Basic data collections, Precipitation (Atmospheric), Streamflow, Runoff, Flow rates, Gaging stations, Water yield, Groundwater movement, Water levels, Water quality, Groundwater recharge, Saline water intrusion, Salinity.
Identifiers: *Israel.

This hydrological yearbook of Israel is the 26th in the series of Hydrological Year-Books. Hydrological and chemical data are presented for the gauging stations on rivers, wadis, main springs, lakes, and reservoirs for the period from October 1, 1970, to September 30, 1971. Yearly rainfall amounted from 80% to 140% of the 1931-60 average in most parts of the country. During November-January rainfall was below average; during April in most regions it was 6 to 14 times that of the long-range average for this month. The total flow from Nahal Keziv in the north to Nahal Shiqma in the south reached about 105 million cu m in 1970-71. Added to this amount was the base flow of Nahal Tanninim and Nahal Ada (downstream the diversion of the Nahaley Menashe project), which amounted to 60 million cu m, with chlorine content of about 850 mg/liter. This total flow measured at the hydrometric stations drains a catchment area of about 6500 sq km compared to the 7800 sq km representing the whole catchment area. The total streamflow includes the quantities stored in various surface reservoirs. In the Kefar Barukh reservoir about 4.3 million cu m were stored, in the Nahaley Menashe reservoirs 15.5 million cu m, and in Shiqma reservoir about 0.9 million cu m were stored. In the spring of 1971, the groundwater level increased by 0.5 m to 1.5 m from that of the previous spring in the northern Coastal Plain. (Woodard-USGS)
W73-12432

HYDROLOGIC MODELS FOR POORLY DEFINED DRAINAGE AREAS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
W. Viessman, Jr.
Available from the National Technical Information Service as PB-222 182, $3.00 in paper copy, $1.45 in microfiche. Project Completion Report, June 1973, 50 p, 27 fig, 5 tab, 26 ref. OWRR-A-021-NEB (1). 14-31-0001-3827.

Descriptors: Hydrology, *Model studies, Rainfall-runoff relationships, *Nebraska, *Drainage area, *Seepage, Management, Storms, *Water management (Applied).

In central Nebraska and many other areas of the Midwest, complex water management problems often arise due to: (1) the flat relief; (2) large surface depressions; (3) rising groundwater levels due to surface irrigation or canal seepage; (4) intense summer storm activity; and (5) poorly defined surface channels. This project was designed to develop modeling techniques for such areas. An individual storm-event model was constructed which employs a series of interconnected reservoirs to simulate large depressed areas.
W73-12496

AN APPROACH TO HYDROGEOLOGIC INVESTIGATIONS OF RIVER ALLUVIUM BY THE USE OF COMPUTERIZED DATA PROCESSING TECHNIQUES,
Oklahoma State Univ., Stillwater. Dept. of Geology.
D. C. Kent, J. W. Naney, and B. B. Barnes.
Ground Water, Vol 11, No 4, p 30-41, July-August 1973. 7 fig, 3 tab, 13 ref.

Descriptors: *Surface-groundwater relationships, *Hydrogeology, *Data processing, *Alluvium, Mathematical models, Alluvial channels, Water balance, Data storage and retrieval, Aquifers, Computer programs, Mapping, Stratigraphy, Oklahoma.

A data storage and retrieval system for hydrogeologic data is designed to produce lithology distribution maps, isophachous maps, and cross sections showing the boundaries and hydraulic characteristics of river alluvium. Emphasis is placed on selecting and coding characteristics of the alluvial sediments, which will facilitate description in terms of hydraulic properties. The hydraulic properties of fluvial deposits for input to the system are defined by analysis of core samples and pump tests. A groundwater study was conducted in the Washita River valley in south-central Oklahoma. Maps and cross sections from the retrieval system were used in conjunction with the hydraulic coefficients and water-level records to estimate the rate of groundwater flow and storage. This information was used for developing a mathematical model of surface runoff as influenced by upstream tributary development. (Knapp-USGS)
W73-12942

FLOW TO WELLS NEAR STREAMS IN THE PRESENCE OF DELAYED YIELD FROM STORAGE AND ANALYSIS OF PUMPING TEST DATA,
Bulgarian Academy of Sciences, Sofia. Geological Inst.
For primary bibliographic entry see Field 04B.
W73-12943

REPORTS FOR CALIFORNIA BY THE GEOLOGICAL SURVEY WATER RESOURCES DIVISION.
Geological Survey, Menlo Park, Calif.

Open-file report, 1973. J. S. Bader, and F. Kunkel, compilers. 111 p.

Descriptors: *Bibliographies, *Water resources, *California, *Publications, Documentation, Information retrieval, Hydrology, Climatic data, Meteorological data, Hydrologic data, Surface waters, Groundwater, Streamflow, Runoff, Water quality, Chemical analysis, Water pollution sources, Water pollution control, Ecology, Water supply, Water demand, Water utilization, Water resources development, Management, Programs, Indexing.

The U.S. Geological Survey has been making water-resources studies in cooperation with the State of California and other public agencies since 1898. This bibliography lists alphabetically by author all water-resources reports prepared by the Geological Survey for those agencies through March 1973. It also lists selected nationwide reports that contain information pertinent to California. In addition, general hydrologic and research reports by personnel of the California district office or the Western regional office at Menlo Park, Calif., are included. The bibliographic list is indexed according to hydrologic area, county, and subject. A report may be indexed under one or more hydrologic areas, counties, and (or) subjects. (Woodard-USGS)
W73-12953

PUBLICATIONS OF WATER RESOURCES INVESTIGATIONS IN COLORADO AND SELECTED PUBLICATIONS PERTAINING TO COLORADO.
Geological Survey, Denver, Colo. Water Resources Div.

Geological Survey, Colorado District report, 1973. 33 p.

Descriptors: *Water resources, *Publications, *Bibliographies, *Colorado, *Projects, Investigations, Water resources development, Groundwater, Surface waters, Geology, Sediment transport, Hydrologic data, Aquifers, Streamflow, Floods, Water quality, Information retrieval.

The water-resources program of the U.S. Geological Survey consists of the collection of basic information through its hydrologic-data stations, areal hydrologic and interpretive studies, and research projects. The basic data collected, the results of the areal studies, and the research findings are presented mainly in publications of the U.S. Geological Survey and Colorado agencies, but some appear also in technical journals and other publications. This list contains publications of water-resources investigations in Colorado that are either published or in preparation and selected publications pertaining to Colorado. (Woodard-USGS)
W73-12954

2B. Precipitation

THEORY OF PRECIPITATION EFFECTS ON DEAD CYLINDRICAL FUELS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
M. A. Fosberg.
For Sci Vol 18, No 2, p 98-108. 1972. Illus.
Identifiers: *Forest fuels, *Precipitation theory, Water uptake.

Numerical and analytical solutions of the Fickian diffusion equation were used to determine the effects of precipitation on dead cylindrical forest

fuels. The analytical solution provided a physical framework. The numerical solutions were then used to refine the analytical solution through a similarity argument. The theoretical solutions predicted realistic rates of water exchange and the internal distribution of the water. The theory also predicted that precipitation duration rather than amount or rate determined the amount of water uptake and provided a function useful in practical applications.–Copyright 1972, Biological Abstracts, Inc.
W73-12381

WATER CONTENT IN CONVECTIVE STORM CLOUDS,
National Center for Atmospheric Research, Boulder, Colo.
T. G. Kyle, and W. R. Sand.
Science, Vol 180, No 4092, p 1274-1276, June 22, 1973. 2 fig, 6 ref.

Descriptors: *Clouds, *Moisture content, Storms, Convection, Hydrologic cycle, Aircraft, Sampling, Measurement, Instrumentation, Atmosphere, Meteorology.
Identifiers: *Storm clouds.

As part of the National Hail Research Experiment, the condensed water content of severe convective storm clouds was measured with an electrically heated evaporator mounted at the wing tip of an armored penetrating aircraft. Cloud interiors were found to be characterized by 1 to 2 km long regions having condensed water contents of approximately 20 g per cu m. (Brown-IPC)
W73-12536

CLIMATOLOGY OF RAINFALL PROBABILITIES FOR OAHU, HAWAII,
National Weather Service, Honolulu, Hawaii. Pacific Region.
A. N. Hull, and J. Pitko.
Available from NTIS, Springfield, Va. 22151, as COM-73-10242 Price $3.00 printed copy; $1.45 microfiche. Technical Memorandum NWSTM PR-10, April 1972. 48 p, 23 fig, 3 tab, 2 append.

Descriptors: *Climatic data, *Hawaii, *Meteorological data, *Precipitation (Atmospheric), *Weather forecasting, Probability, Statistics, Weather data, Weather patterns, Orography, Winds.
Identifiers: *Oahu (Hawaii).

Probability forecasts are given for local and island-wide rainfall for Oahu, Hawaii. Statistical probability of rainfall is tabulated by months. Also included is the persistence of 'wet' or 'dry' periods. The combination of climatological probability of rainfall and the persistence of the present weather are essential information for reaching a logical forecast of rain or no rain for any location on the island of Oahu. Maps show the statistical probability of daily rainfall for Oahu for each month of the year as well as an annual summary. Also included is a brief description of the various rainfall regimes that are found on the island. The data used in preparing the maps were extracted from the latest 30 years (1941-1970) of rainfall records. For regions of sparse data, shorter periods of record were used but in no case were records with less than 15 years entered into the analyses. In all, the data from 68 stations were plotted and analyzed. The frequency distribution of hourly rainfall statistics was gained by compiling hourly data for five stations representing different rainfall regimes on Oahu. For the normally dry areas of Oahu, summer has the lowest percentage of rainy days per month and winter the highest percentage. July presents an anomalously high percentage in most of these dry areas. In the normally wet areas of Oahu, summer has the highest percentage of rainy days per month with winter having the lowest percentage. The most populated areas of the island normally have monthly percentages of rainy days in the range of 40%-60% each month. (Knapp-USGS)
W73-12587

EXTREMES OF HYDROMETEORS AT ALTITUDE FOR MIL-STD-210B: SUPPLEMENT--DROP-SIZE DISTRIBUTIONS,
Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
P. Tattleman, and N. Sissenwine.
Available from NTIS, Springfield, Va. 22151 as AD-756 832 - Price $3.00 printed copy; $1.45 microfiche. Technical Report AFCRL-TR-73-0008, January 9, 1973. 15 p, 1 fig, 3 tab, 8 ref.

Descriptors: *Rainfall intensity, *Rain, *Tropical regions, *Raindrops, Rain water, Rainfall, Precipitation (Atmospheric).
Identifiers: *Raindrop sizes.

Estimates have been provided for extreme rainfall intensities and associated liquid water content at altitude with 0.1% and 0.5% probabilities in the most severe month in the rainy tropics. Analogous values have been included for two alltime record rainstorms, one for 1 min, and the other lasting 42 min. Drop-size distributions are given for the 1 min record, and for the 0.1% and 0.5% worst month in tropics from a theoretical expression that best fits the available empirical size distributions. Liquid water content obtained from an integral of this theoretical expression is compared to the liquid water content obtained by arithmetically adding the volumes of each drop for three drop-size distributions. (Knapp-USGS)
W73-12599

ON THE NUMBER DISTRIBUTION OF HAIL GROWING IN UPDRAFTS,
Toronto Univ. (Ontario). Dept. of Physics.
R. B. Charlton, and R. List.
Available from NTIS, Springfield, Va. 22151 as COM-72-11428 - Price $3.00 printed copy; $1.45 microfiche. In: Proceedings of Conference on Cloud Physics, August 24-26, 1970, Fort Collins, Colorado: Colorado State University, p 51-52, 1971. 7 fig, 3 ref.

Descriptors: *Cloud physics, *Hail, *Crystal growth, *Air circulation, Convection, Atmosphere, Freezing, Model studies, Storms, Graupel, Meteorology, Mass curves.

The formation of hail in a convection updraft causes liquid water depletion and imposes a body force on the updraft's air parcels. Conversely, the growth of hailstones is dependent on their ability to compete for the available liquid water and on the updraft field's reaction to their presence. A model is based on hail embryos injected continuously in known numbers and sizes at the OC level of a nondivergent (cloud air density times updraft velocity equals constant at all levels) and predetermined updraft. The only cloud parameter directly influenced by the growing hailstones is the liquid water content (LWC). The hailstones move at terminal velocity (drag coefficient 0.5) and accrete (with 100% efficiency) the LWC which moves at updraft speed. Two types of growth from an embryo size spectrum are considered, both of which are steady-state. The first grows hail as it ascends from the input level. The second type considers hailstones ascending to their balance levels and also growing while descending back to the input level. All examples calculated showed that hail mass accumulation zones can be equivalent only to 2 to 4 times the natural LWC, and that moderate LWC depletion (20-40%) is equally sufficient to considerably influence the cloud's energy balance. (Woodard-USGS)
W73-12602

DYNAMICS OF A FALLING PARTICLE ZONE,
Toronto Univ. (Ontario). Dept. of Physics.
T. L. Clark, and R. List.
Available from NTIS, Springfield, Va. 22151 as COM-72-14428 - Price $3.00 printed copy; $1.45 microfiche. Journal of the Atmospheric Sciences, Vol 28, No 5, p 718-727, July 1971. 8 fig, 12 ref. NOAA Grant E22-75-71 (G).

Descriptors: *Cloud physics, *Precipitation (Atmospheric), *Particle size, Raindrops, Dynamics, Model studies, Numerical analysis, Meteorological data, Temperature, Winds, Velocity, Atmosphere, Air circulation, Equations, Drops (Fluid).
Identifiers: *Precipitation particles.

Some of the factors which can affect the distribution of precipitation-sized particles within a cloud are coalesence, breakup, sedimentation, and gravitational feedback effects. The two latter factors are discussed. Two-dimensional zones of single-sized particles falling in still air are discussed using a numerical model. Coalescence and breakup is ignored so that the fall pattern and the flow created by the falling particles can be isolated. The results indicate that the rather unorthodox use of an eddy viscosity in the momentum equations and not in the advection equation for the particle zone did not affect the calculations appreciably. Thus, the results can be assumed to visualize the nonturbulent case of a falling particle zone. (Woodard-USGS)
W73-12603

SIMULATIONS OF METEOROLOGICAL VARIATIONS OVER ARCTIC COASTAL TUNDRA UNDER VARIOUS PHYSICAL INTERFACE CONDITIONS,
Center for the Environment and Man, Inc., Hartford, Conn.
N. W. Lord, J. P. Pandolfo, and M. A. Atwater.
Arct Alp Res. Vol 4, No 3, p 189-209. 1972. Illus.
Identifiers: *Arctic coastal zone, *Meteorological conditions, Moisture, *Simulation, Temperature, *Tundra.

Meteorological properties of the tundra are treated within the context of a general ecosystem model. The biosphere is placed in the role of an active interface within a stack of horizontally uniform physical layers under the influence of incident solar radiation, the demonstrably dominant exogenous state variable. Diurnal variation of the thermodynamic states of these physical layers is calculated as the solution of differential equations governing the diffusion of heat and moisture. The results of numerical experiments on dry ground regions demonstrate that atmospheric moisture and temperature, during the biotically active summertime, are influenced by the meteorological history of the immediately preceding summertime level of the permafrost boundary. They are influenced to a degree that is at least comparable to the effect of daily fluctuations in cloud cover and prevailing winds. Numerical experiments on tundra shallow lakes imply a strong influence by the region's heterogeneity on near-surface air temperatures.–Copyright 1973, Biological Abstracts, Inc.
W73-12983

2C. Snow, Ice, and Frost

TRITIUM AND DEUTERIUM CONTENT OF THE SNOW IN GROENLAND,
For primary bibliographic entry see Field 05B.
W73-12418

GLACIAL ENVIRONMENT AND PROCESSES IN SOUTHEASTERN ALASKA,
Massachusetts Univ., Amherst. Coastal Research Center.
J. H. Hartshorn, and G. M. Ashley.
Technical Report No 4-CRC, August 1972. 69 p, 79 fig. ONR N00014-67-A-0230-0001.

Descriptors: *Erosion, *Sedimentation, *Glaciation, *Alaska, *Geomorphology, Land forming, Topography, Sediment transport, Glacial drift, Alluvial fans, Alluvium, Glaciers, Braiding, Sedimentary structures.

The dominant surficial geologic processes in southeastern Alaska are glaciation and stream action. Glaciers erode bedrock, sculpture characteristic landforms, and deposit subglacial and marginal debris. In areas vacated by the glacier, sediment-laden streams help to construct a landscape whose varied landforms originate from the complex interaction between a retreating ice margin, disintegrating ice, and running or ponded meltwater. The major landforms in terms of area and volume are outwash fans, which are formed seaward of the glaciers mainly by the accretion of bars in braided streams, and which commonly form the low-lying coastal foreland. The sediment in transport in meltwater streams may be stored permanently or temporarily in glaciofluvial landforms or may reach its ultimate destination, the sea, where it is reworked by coastal erosion and deposition. (Knapp-USGS)
W73-12423

PROBLEMS IN THE PRODUCTION OF A SPRING FLOOD (VOPROSY FORMIROVANIYA VESENNEGO POLOVOD'YA).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 04A.
W73-12435

INVESTIGATION OF THERMAL PROPERTIES OF SOILS IN THE DON RIVER BASIN FOR ESTIMATION OF SNOWMELT LOSSES TO INFILTRATION INTO FROZEN SOIL (ISSLEDOVANIYE TEPLOVYKH SVOYSTV POCHV BASSEYNA R. DONA DLYA OTSENKI POTER' TALYKH VOD NA IN FIL'TRATSIYU V MERZLUYU POCHVU),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W73-12436

LABORATORY INVESTIGATIONS OF THE TRANSMISSION CAPACITY OF FROZEN AND THAWED SOILS BASED ON DATA OF THE VALDAY FIELD LABORATORY (VNIGL) (LABORATORNYYE ISSLEDOVANIYA VODOPROPUSKNOY SPOSOBNOSTI MERZLYKH I TALYKH POCHVO-GRUNTOV (PO MATERIALAM MERZLOTHOY LABORATORII VNIGL)),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W73-12437

EVAPORATION DURING A FLOOD PERIOD CAUSED BY SPRING SNOWMELT (ISPARENIYE V PERIOD VESENNEGO SNEGOTAYANIYA I POLOVOD'YA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02D.
W73-12442

GREEN SNOW AND ICE FROM THE ANTARCTICA,
National Museum of Natural History, Budapest (Hungary).
For primary bibliographic entry see Field 02I.
W73-12644

LAKE MOVEMENTS WITH PARTIAL ICE COVER,
Ontario Water Resources Commission, Toronto.
For primary bibliographic entry see Field 02H.
W73-12663

SNOW COVER OF THE ISSYK-KUL' DEPRESSION AND ITS ALPINE ENVIRONMENT (SNEZHNYY POKROV ISSYK-KUL'SKOY KOTLOVINY I YEYE VYSOKOGORNOGO OBRAMLENIYA),
A. N. Dikikh.
Vsesoyuznoye Geograficheskoye Obshchestvo Izvestiya, Vol 105, No 1, p 47-51, January-February 1973. 1 fig, 3 tab, 3 ref.

Descriptors: *Snow cover, *Snowpacks, *Alpine, *Mountains, Glaciers, Density stratification, Precipitation (Atmospheric), Weather, Air temperature, Snow surveys, Maps.
Identifiers: *USSR (Kirgiz), *Issyk-Kul' depression.

Characteristics of snow cover in the Issyk-Kul' depression were investigated in snow surveys performed by the Kirgiz Administration of the Hydrometeorological Service. Average duration of snow cover ranges from 39 days in the vicinity of Cholpon-Ata to 297 days in the glacierized zone. Snow density in the initial period of formation of snow cover varies between 0.16 and 0.20 g/cu cm. Snow density on glaciers in the initial period of snow accumulation reaches 0.40 g/cu cm. On the basis of snow-cover distribution, 4 regions were identified: (1) the western part, where snow depths are 0-10 cm; (2) the central and eastern parts, where snow depths are 10-50 cm; (3) the northern slopes of Terskey Alatoo ridge in the eastern part, where snow depths are 50-100 cm; and (4) the glacierized zone of the ridge, where snow depths are greater than 100 cm. Maximum average 10-day depths of snow cover in the depression are tabulated and mapped. (Josefson-USGS)
W73-12726

TRIALS ON TRENDS THROUGH CLUSTERS OF CIRQUES,
Monash Univ., Clayton (Australia).
For primary bibliographic entry see Field 02J.
W73-12732

THE EFFECT OF SOIL TEMPERATURE ON PLANTS GROWN IN SALINE SOIL,
Hebrew Univ., Rehovot (Israel). Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W73-12797

ESTIMATING SNOW-WATER EQUIVALENT FROM POINT-DENSITY MEASUREMENTS OF FOREST STANDS,
Canadian Forest Service, Edmonton (Alberta).
For primary bibliographic entry see Field 04A.
W73-12827

SIMULATIONS OF METEOROLOGICAL VARIATIONS OVER ARCTIC COASTAL TUNDRA UNDER VARIOUS PHYSICAL INTERFACE CONDITIONS,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 02B.
W73-12983

2D. Evaporation and Transpiration

EVAPORATION DURING A FLOOD PERIOD CAUSED BY SPRING SNOWMELT (ISPARENIYE V PERIOD VESENNEGO SNEGOTAYANIYA I POLOVOD'YA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
O. I. Krestovskiy, A. N. Postnikov, and A. G. Sergeyeva.
In: Voprosy formirovaniya vesennego polovod'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 165-182, Leningrad, 1972. 1 fig, 8 tab, 28 ref.

Descriptors: *Evaporation, *Floods, *Snowmelt, *Spring, Water loss, Water balance, Water storage, Runoff, Precipitation (Atmospheric), Snow, Water equivalent, Soils, Surfaces, Watersheds (Basins), Forest watersheds, Grasslands, Estimating, Measurement, Equations.
Identifiers: European USSR, *Kazakhstan.

Evaporation from snow, water, and soil surfaces in spring was investigated on lowland areas in European Russia and DKazakhstan. Estimates are made of losses of water to evaporation during a flood period for watersheds in forested and forest-steppe regions of European Russia, and methods are proposed for evaporation measurements in the northwest. In the northwestern forested region, total evaporation from watersheds varies annually between 35 mm and 90 mm (average 60 mm) and depends mainly on the duration of the spring flood. In forest-steppe and steppe regions, total evaporation from watersheds during flood periods for different spring seasons varies between 15 mm and 60 mm (average 35-45 mm). In northwestern and forest-steppe regions, total evaporation averages 1.2 mm/day. Water losses to total evaporation in forested and forest-steppe regions average 30% of the precipitation and water equivalent of snow in a flood period and vary annually from 10% in flood periods with heavy snow accumulation to 70% in relatively open spring seasons. (See also W73-12435) (Josefson-USGS)
W73-12442

A COMPARISON OF RATES OF WATER LOSS THROUGH TRANSPIRATION OF SEVERAL SOUTHERN NEW MEXICO PHREATOPHYTE SPECIES,
New Mexico State Univ., University Park. Dept. of Biology.
G. L. Cunningham, J. G. Fraser, R. E. Grieve, and H. G. Wolfe.
Available from the National Technical Information Service as PB-222 277, $3.00 in paper copy, $1.45 in microfiche. New Mexico Water Resources Research Institute Report No. 025, Technical Completion Report, 1973, 32 p, 12 fig, 4 tab, 17 ref. OWRR-B-021-NMEX (1) and B-027-NMEX (1).

Descriptors: *Phreatophytes, *New Mexico, *Transpiration, Transpiration control, Mathematical models, *Water loss, Riparian plants, *Riparian water loss.
Identifiers: *Species leaf surface area, Basal stem diameter, Boundary layer resistance, Stomatal resistance, Mesophyll resistance, Irradiance, Prosopis pubescens (Screw bush), Salix amygdaloides (Willow), Tamarix pentandro (Salt cedar), Baccharis glutinosa (Seep willow), Lycium torieyi (Wolfberry), Populus fremontii (Cottonwood).

The development and use are described of a method of estimating transpirational water use by riparian plant communities. The method involves the development and use of mathematical models to predict transpiration rates on a leaf area basis from environmental data. These models were used in conjunction with leaf area estimates for a study stand to evaluate transpirational water use. The results indicate that differences exist among species. Species which are found in less disturbed stands tend to be much more conservative in their transpirational water use. (Creel-New Mexico State)
W73-12497

WATER PATHWAYS IN HIGHER PLANTS: III. THE TRANSPIRATION STREAM WITHIN LEAVES,
Southampton Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 02I.
W73-12652

AVERAGE BOWEN-RATIO METHODS OF CALCULATING EVAPORTRANSPIRATION APPLIED TO A DOUGLAS FIR FOREST,
British Columbia Univ., Vancouver. Dept. of Soil Science.
T. A. Black, and K. G. McNaughton.
Boundary-Layer Meteorol. Vol 2, No 4, p 466-475. 1972. Illus.
Identifiers: *Bowen-ratio method, *Douglas-Fir, *Evapotranspiration, Forests, Transpiration, Winds, Measurement.

Daily evapotranspiration from a Douglas fir forest was calculated using Webb's average Bowen-ratio method. Webb's method is generalized to include the effects of the diabatic wind profile. Over a 17-day period characterized by light winds, the modified Webb method agreed with the daily totals of half hr energy balance calculations to within 1 1/2% on the average, while Webb's method overestimated by 26% on the average.--Copyright 1973, Biological Abstracts, Inc.
W73-12801

HEAT AND WATER BALANCE STUDIES ON GRAND CAYMAN,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
S-A. Hsu, M. E. C. Giglioli, P. Reiter, and J. Davies.
Caribb J Sci. Vol 12, No 1-2, p 9-22, 1972, Illus.
Identifiers: *British West Indies, *Grand Cayman Island (B.W.I.), Heat balance, Mangrove, Swamp, Transpiration, Water balance, *Evapotranspiration.

On the basis of field measurements from 1967 through 1970 and all available climatological data on Grand Cayman Island (British West Indies), components of heat and water-balance equations were analyzed. Water-balance studies on a riverless, tropical coast showed that the soil-moisture content can be estimated by measuring the difference between precipitation and evaporation on sandy coasts and between precipitation and evapotranspiration in mangrove swamp areas. Heat-balance studies in the same environments revealed that on a mangrove swamp floor the potential evapotranspiration can be predicted by the ratio of net radiation to latent heat of vaporization.--Copyright 1973, Biological Abstracts, Inc.
W73-12822

WATER POTENTIAL IN RED PINE: SOIL MOISTURE, EVAPOTRANSPIRATION, CROWN POSITION,
Minnesota Univ., St. Paul. Coll. of Forestry.
For primary bibliographic entry see Field 02I.
W73-12837

SOME EFFECTS OF EVAPORATION SUPPRESSION ON RESERVOIR ECOLOGY,
North Texas State Univ., Denton. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W73-12869

ANTITRANSPIRANT FILM: CURTAILING INTAKE OF EXTERNAL WATER BY CHERRY FRUIT TO REDUCE CRACKING,
California Univ., Davis. Dept. of Water Science and Engineering.
D. C. Davenport, K. Uriu, and R. M. Hagan.
Hortscience, Vol 7, No 5, p 507-508, 1972. Illus.
Identifiers: Absorption, *Cherry fruit, Cracking, Films, Fruit, Prunus-avium, Rain, *Antitranspirant films.

An antitranspirant film was used as a research tool to determine which part of the sweet cherry (Prunus avium L.) fruit is the principal path for absorption of external water (rain). Antitranspirant applied to the entire fruit surface reduced water intake to half that of control fruit or fruit treated only on the top and/or bottom. A preliminary field trial investigated the film's 'raincoating' effect as a possible means for reducing cherry cracking.--Copyright 1973, Biological Abstracts, Inc.
W73-12992

ANTITRANSPIRANTS FOR CONSERVATION OF LEAF WATER POTENTIAL OF TRANSPLANTED CITRUS TREES,
California Univ., Davis. Dept. of Water Science and Engineering.
D. C. Davenport, P. E. Martin, and R. M. Hagan.
Hortscience. Vol 7, No 5, p 511-512, 1972. Illus.
Identifiers: *Antitranspirants, *Citrus, Leaf-water potential, Transplanted trees, Water conservation.

Spraying 7-yr-old citrus trees with film-forming antitranspirants before transplanting increased leaf water potential, thereby reducing 'transplant shock'. Leaf water potential decreased rapidly after transplanting, by as much as 21 atm in unsprayed, and as little as 6 atm in sprayed trees. There was little benefit from transplanting in late afternoon rather than the morning.--Copyright 1973, Biological Abstracts, Inc.
W73-12993

RELATIVE WATER CONTENT OF LEAVES: UNDERESTIMATION CAUSED BY ANTITRANSPIRANT FILM,
California Univ., Davis. Dept. of Water Science and Engineering.
D. C. Davenport.
J Exp Bot. Vol 23, No 76, p 651-654, 1972.
Identifiers: Films, *Leaves, Relative, *Antitranspirant films.

When leaf discs are floated to obtain turgid weight in the assessment of the effect of an antitranspirant film on relative water content, water trapped by the film itself gives an over-estimation of turgid weight, and hence a low value for relative water content.--Copyright 1973, Biological Abstracts, Inc.
W73-12994

2E. Streamflow and Runoff

PREDICTION OF MIXING LENGTHS FOR RIVER FLOW GAGING,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-12414

COMPUTING BACKWATER AT OPEN CHANNEL CONSTRICTIONS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 08B.
W73-12415

EXTREME ROUGHNESS OF NATURAL RIVER CHANNEL,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 08B.
W73-12416

FACTORS PRODUCING THE OUTSTANDING SPRING FLOOD OF 1970 IN UPPER DON RIVER BASINS (USLOVIYA FORMIROVANIYA VYDAYUSHCHEGOSYA VESENNEGO POLOVOD'YA 1970 G. V BASSEYNAKH REK VERKHNEGO DONA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
L. K. Vershinina.
In: Voprosy formirovaniya vesennego polovod-'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 75-92, Leningrad, 1972. 4 fig, 9 tab, 6 ref.

Descriptors: *Floods, *Spring, *River basins, Discharge (Water), Runoff, Water loss, Water balance, Water storage, Precipitation (Atmospheric), Water equivalent, Snowmelt, Melt water, Thawing, Ice, Antecedent moisture content, Field capacity, Air tempeerature, Equations.
Identifiers: USSR, *Don River.

The factors responsible for the 50 to 100 year flood on the Upper Don in the spring of 1970 are examined. An exceptionally high rate of snowmelt, reaching 40-50 mm/day, was observed in northern regions of the basin, while the rate of snowmelt in southern regions did not exceed 5-10 mm/day. This difference in snowmelt rates was the principal cause of major flooding in the north and of minor flooding in the south. Spring-runoff losses were 120-150 mm or 70% of total water storage in southern regions and 30-40 mm or 15%-25% of total water storage in northern regions. (See also W73-12435) (Josefson-USGS)
W73-12440

HEATED SENSORS FOR FLOW MEASUREMENTS,
For primary bibliographic entry see Field 07B.
W73-12618

THE SUPERIMPOSITION HYPOTHESIS FOR INCISED MEANDERS--A GENERAL REJECTON AND SPECIFIC TEST,
Makerere Univ., Kampala (Uganda).
K. J. Tinkler.
Area (Institute of British Geographers), Vol 4, No 2, p 86-91, 1972. 1 fig, 12 ref.

Descriptors: *Meanders, *Geomorphology, Valleys, Topography, Paleoclimatology, Drainage patterns (Geologic).

The superimposition hypothesis that incised bedrock meanders are inherited from river (alluvial) meanders in a previous low relief cycle is disputed. A specific test based on known area/wavelength relationships for valley and river meanders is proposed. The lithological environment of the channel exerts a controlling influence on channel meander wavelength. There is no great difference between the dimensionless ratios that characterize the geometry of meanders incised in rock and those for alluvial, or river, meanders. The lithological environment acts as a filter on wavelengths so that for a given lithology, wavelengths begin to form only when some threshold stress is overcome by channel flow sufficient to induce bank erosion. A wide range of discharges is in fact available in most streams. For most lithologies a discharge with sufficient power to induce bank erosion probably exists in most streams given a long enough recurrence interval. It is evident that meander parameters are not unambiguous indicators of Pleistocene climates. (Knapp-USGS)
W73-12736

CLIMATIC CHANGE AND ARRESTED MEANDER DEVELOPMENT ON THE RIVER SEVERN,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 04A.
W73-12737

A PROPOSED STREAMFLOW DATA PROGRAM FOR CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 04A.
W73-12748

STAGE-DISCHARGE RELATIONS ON BIG LOST RIVER WITHIN NATIONAL REACTOR TESTING STATION, IDAHO,
Geological Survey, Idaho Falls, Idaho. Water Resources Div.
For primary bibliographic entry see Field 04A.
W73-12750

PRELIMINARY FLOOD-FREQUENCY RELATIONS FOR SMALL STREAMS IN GEORGIA,
Geological Survey, Atlanta, Ga.
For primary bibliographic entry see Field 04A.
W73-12946

HYDROLOGIC RECORDS FOR LAKE COUNTY, FLORIDA: 1971-72,
Geological Survey, Tallahassee, Fla.
C. P. Laughlin, and M. C. Schol.
Geological Survey Open-file report (73009), 1973. 87 p, 47 fig, 24 tab, 4 ref.

Descriptors: Water resources, *Hydrologic data, *Groundwater, *Surface waters, *Florida, Basic data collections, Rainfall, Streamflow, Runoff, Aquifer characteristics, Well data, Water levels, Water quality, Chemical analysis, Lakes, Hydrology.
Identifiers: *Lake County (Fla).

Records of water levels in wells and lakes and chemical and bacteriological analyses are reported for Lake County, Florida, from May 1971 to May 1972. Stream discharge records are reported on a water year basis; stream-discharge records are presented for the 1971 water year (October 1, 1970 to September 30, 1972). The flow of Big Creek near Clermont and Palatlakaha River at Cherry Lake Outlet was very low for the 1971 water year (9% and 14%, respectively) compared to the long-term average. The long-term, month-end hydrographs show that lake levels were the highest of record in 1960 and lowest in 1962. The levels in the lakes of the Apopka chain were generally near normal throughout 1971and near normal or above during the first part of 1972. Most groundwater withdrawn in the county is from the Floridan aquifer. Water levels in the Floridan aquifer in May 1972 were generally higher than in May 1971. However, in the northern part of the county and also in the Mascotte-Groveland area, the water levels were down. Three streams, 5 lakes, and 8 clastic-aquifer wells are sampled annually for chemical analyses under this program. In addition, water-quality data are available for 2 streams and 9 lakes in the county from other Geological Survey cooperative programs. The chemical analyses are tabulated. (Woodard-USGS)
W73-12949

2F. Groundwater

ANALYSIS OF SEEPAGE INTO GROUND--WATER SYSTEM,
Ife Univ. (Nigeria). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04B.
W73-12412

ENVIRONMENTAL ISOTOPES AND CIRCULATION IN AQUIFERS UNDER VENICE (ISOTOPES DU MILIEU ET CIRCULATIONS DANS LES AQUIFERES DU SOUS-SOL VENITIEN),
Turin Univ. (Italy). Istituto di Geologia e Paleontologia.
G. Bortolami, J-C. Fontes, and C. Panichi.
Earth and Planetary Science Letters, Vol 19, No 2, p 154-167, June 1973. 4 fig, 18 ref.

Descriptors: *Groundwater movement, *Water circulation, *Artesian aquifers, *Confined water, *Recharge, Stable isotopes, Carbon radioisotopes, Hydrogeology, Karst, Karst hydrology.
Identifiers: *Italy (Venice).

The subsidence of the plain of Venice (about 1 cm/yr) is caused by overexploitation of deep artesian aquifers. Stable isotopes show the existence of two groups of deep waters both correlated to a cold climatic recharge. These waters are clearly different from those of the unconfined shallower aquifers. The deep waters are recharged in the basins of the Prealpine rivers. Brenta and Piave, in the paleochannel of the alpine river Adige. The waters of Prealpine type are located under the main part of the plain. The waters coming from the Prealpine area exhibit relatively high tritium contents (85 to 120 TU) and rather low C-14 activities (60% to 70%). The dissolved carbon has not undergone any significant exchange with solid carbonates. The circulation is rapid in the recharge areas where the waters circulate in the hydrographic network of the karstic system of the Prealps. In the lower parts of the plain the flow velocities are low and decrease eastward and downward from 3 m/yr to 1 m/yr. It is possible that a drastic reduction of these velocities occurs in the western part of the plain due to a major sedimentological discontinuity, such as the western limit of the marine deposits. (Knapp-USGS)
W73-12419

SELECTED DATA ON WELLS IN THE BARSTOW AREA, MOJAVE RIVER BASIN, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 04B.
W73-12421

GEOHYDROLOGY OF THE DOVER AREA, DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 07C.
W73-12425

ESTIMATION AND FORECAST OF WATER LOSSES DURING A SPRING FLOOD TO GROUNDWATER RECHARGE FOR WATERSHEDS IN NORTHWESTERN EUROPEAN USSR BASED ON DATA OF THE VALDAY FIELD LABORATORY (OTSENKA I PROGNOZ POTER' VODY V PERIOD VESENNE GO POLOVOD'YA NA POPOLNENIYE ZAPASOV GRUNTOVYKH VOD DLYA VODOSBOROV SEVERO-ZAPADA YETS (PO MATERIALAM VNIGL)),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
N. I. Kapotova.
In: Voprosy formirovaniya vesennego polovod-'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 62-74, Leningrad, 1972. 7 fig, 6 tab, 4 ref.

Descriptors: *Water loss, *Groundwater recharge, *Floods, *Watersheds (Basins), *Forecasting, Estimating, Water storage, Water table, Water equivalent, Snowmelt, Runoff, Spring, Variability, Curves.
Identifiers: European USSR, *Valday Field Laboratory.

Groundwater recharge during a spring flood is defined as the difference in groundwater storage at the beginning and end of the flood. At the beginning of a flood, groundwater storage in the Valday Hills varies in individual years between 50 mm and 100 mm (coefficient of variation is 0.22). At the end of a flood, groundwater storage averages 120 mm and varies slightly from year to year (coefficient of variation is 0.03). Water losses average 50 mm and vary annually between 25 mm and 65 mm (coefficient of variation is 0.22). At the beginning of a flood, groundwater storage in individual plots for different years varies between 10 mm and 160 mm and at the end of a flood, between 50 mm and 240 mm. Water losses on individual plots vary between 0 mm and 150 mm. Recommendations are given for a 2-3 month advance forecast of water losses to groundwater recharge for consideration in preparing forecasts of spring runoff in northwestern European Russia. (See also W73-12435) (Josefson-USGS)
W73-12439

PHYSICAL CHARACTERISTICS OF BASALT AQUIFERS,
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 04B.
W73-12523

SURVEY OF INDUSTRIAL WASTE INJECTION WELLS, VOLUME II,
Missouri Univ., Rolla. Dept. of Geological Engineering.
For primary bibliographic entry see Field 05E.
W73-12576

GROUND-WATER RESOURCES, NELSON AND WALSH COUNTIES, NORTH DAKOTA,
Geological Survey, Grand Forks, N. Dak.
J. S. Downey.
North Dakota State Water Commission County Ground-Water Studies 17, Part 3, and North Dakota Geological Survey Bulletin 57, Part 3, 1973. 25 fig, 4 plate, 5 tab, 60 ref.

Descriptors: *Groundwater resources, *Water wells, *Water supply, *North Dakota, Well data, Aquifer characteristics, Water yield, Water quality, Specific capacity, Transmissivity, Groundwater movement, Hydrogeology, Water level fluctuations.
Identifiers: *Nelson and Walsh Counties (N DAK).

Nelson and Walsh Counties, North Dakota, are underlain by bedrock of Ordovician, Jurassic, and Cretaceous age. The Fall River and Lakota Formations (Dakota aquifer) and the Pierre Formation of Cretaceous age contain the principal bedrock aquifers. The Dakota aquifer, which consists of sandstone, may yield more than 500 gpm at selected locations. The Pierre aquifer, which consists of fractured shale, yields from 1 to 5 gpm. Water from both aquifers is of poor quality, but usable. The Jurassic and Ordovician aquifers yield a sodium chloride type water that is very saline. Yields greater than 500 gpm may be locally available from the Ordovician aquifers. The Spiritwood, McVille, and Fordville glacial-drift aquifers are capable of yielding more than 500 gpm of fair to good quality water. Several smaller drift aquifers--the Edinburg, Medford, and beach deposits--supply water of good to poor quality. The eastern part of Walsh County is the discharge area for a deep regional groundwater flow system that originates in the high parts of Cavalier, Nelson, and Walsh Counties and areas to the west. Water moving in this flow system becomes more saline and becomes a sodium chloride type as it moves to the discharge area. Saline lakes occur in eastern Walsh County as the result of natural artesian discharge from the deep groundwater flow system. Six communities in the project area use groundwater supplies. (Woodard-USGS)
W73-12578

GEOLOGY OF NELSON AND WALSH COUNTIES, NORTH DAKOTA,
Geological Survey, Grand Forks, N. Dak.
J. P. Bluemle.
North Dakota Geological Survey Bulletin 57, Part 1, and North Dakota State Water Commission County Ground Water Studies 17, Part 1, 1973. 30 fig, 4 plate, 52 ref.

Descriptors: *Geology, *Groundwater, *Aquifers, *North Dakota, Natural resources, Land use,

Construction, Foundations, Topography, Surveys, Mapping, Bedrock, Glacial sediments, Economics, Construction materials, Gravels.
Identifiers: *Nelson and Walsh Counties (N Dak).

Nelson and Walsh Counties are located in northeastern North Dakota on the Eastern edge of the Williston basin. Precambrian rocks range in depth from 300 to 2,800 feet. They are overlain by Paleozoic and Mesozoic rocks that dip to the west at low angles. Glacial drift covers the entire area except along a few deeply eroded valleys where Cretaceous shale is exposed. The glacial drift reaches a maximum thickness of over 300 feet in the McVille trench of southern Nelson County. Economic mineral deposits include sand and gravel of the beach ridges and river terraces and groundwater and surface water. Although no commercial hydrocarbon production has yet been found, the many possibilities for stratigraphic and structural traps along with shallow drilling depths allowing easy and fast drilling sould do much to promote exploration in the area. The glacial deposits form the major aquifers in the prospect area. Detailed geologic maps of the two-county area are included. The information should be of value to anyone interested in the distribution of the geologic units that have potential as aquifers. Data are also supplied on the engineering properties of foundation materials at possible construction sites. (Woodard-USGS)
W73-12579

PRESIDIO BOLSON, TRANS-PECOS TEXAS AND ADJACENT MEXICO: GEOLOGY OF A DESERT BASIN AQUIFER SYSTEM,
Texas Univ., Austin.
C. G. Groat.
Bureau of Economic Geology Report of Investigations No 76, 1972. 46 p, 20 fig, 56 ref.

Descriptors: *Hydrogeology, *Bolsons, *Texas, *Alluvium, *Groundwater basins, Stratigraphy, Sedimentology, Mexico, Geomorphology, Gravels, Erosion, Aquifers.
Identifiers: *Presidio (Tex).

The Presidio Bolson in Texas and Mexico is one of several mountain-bounded basins in the Mexican Highlands section of the Basin and Range physiographic province. Mountain-bounded basins or bolsons are the most important aquifer systems throughout most of southwestern and western United States and northern Mexico. The dissection of the Presidio Bolson by the Rio Grande and its tributaries has afforded an ideal situation for detailed study of the stratigraphy of one of these important aquifer systems. The basin is filled with detritus from the surrounding mountains. Poorly sorted conglomerate and interbedded sandstone deposited on alluvial fans characterize the basin-margin facies; gypsiferous mudstone and fine sandstone of the basin-center facies (the greatest volume of deposits) were deposited on the toes of alluvial fans and in playa lakes. Groundwater is the most valuable resource in the basin. The most reliable supplies are obtained from Rio Grande alluvium south of the juncture with the Rio Conchos. Sidestream alluvium yields small quantities of water in a few places. The bolson fill is potentially the most important aquifer, but the large plug of impermeable, gypsiferous mudstone results in small yields of poor-quality water over much of the bolson. (Knapp-USGS)
W73-12585

EVALUATION OF THE WATER RESOURCES OF LEMMON VALLEY, WASHOE COUNTY, NEVADA, WITH EMPHASIS ON EFFECTS OF GROUND-WATER DEVELOPMENT TO 1971,
Geological Survey, Reno, Nev.
For primary bibliographic entry see Field 04B.
W73-12718

HYDROGEOLOGY OF THE CARBONATE ROCKS, FREDERICK AND HAGERSTOWN VALLEYS, MARYLAND,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-12719

CONVECTIVE GROUND WATER FLOW,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
J. Eliasson.
Series Paper No 3, 1973. 107 p, 30 fig, 11 tab, 23 ref.

Descriptors: *Convection, *Groundwater movement, Porous media, Boundary processes, Mathematical studies, Computer programs, Mass transfer, Heat transfer, Heat flow, Turbulence.

Convective groundwater flow and related phenomena may be investigated by two methods that are different both in principle and applicability. The first method is the linear method. The criterion for its application is that the departures of temperatures and velocities from their mean values are so small that terms quadratic in these quantities can be neglected. The linear method is applicable to subcritical flow and to analysis of the stability of stationary flows. When the initial instabilities have grown big enough, the linear flow is replaced by nonlinear convection where interactions between flow on different frequencies is predominant. In the two-dimensional case, when the flow is a system of horizontal rectangular rolls, this interaction between the frequencies can be written in terms of the Fourier transform of the temperature function or the stream function. (Knapp-USGS)
W73-12722

GROUND WATER MODELS WITH PARALLEL LINEAR RESERVOIRS,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
J. Eliasson, S. Arnalds, S. Johannsson, and S. P. Kjaran.
Series Paper No 1, 1973. 53 p, 19 fig, 5 tab, 6 ref.

Descriptors: *Hydrogeology, *Groundwater movement, *Unsteady flow, *Water level fluctuations, Mathematical models, Computer programs, Boundary processes, Artesian aquifers, Surface-groundwater relationships.

Unsteady groundwater flow in an aquifer of limited horizontal extent and arbitrary boundary shape may be described by the differential equation of heat conduction, the solution of which includes the solving of an eigenvalue problem by a numerical method. Boundary conditions are provided by nature in the form of watertight formations, rivers, lakes, or any other kind of constant hydraulic head connected to the aquifer. Discharge is the sum of the flow through infinitely many linear reservoirs, corresponding to the eigenfunctions. The resulting equations for groundwater level and discharge are sums of convolution integrals of the infiltration, an easy process to handle in a digital computer. The mathematical model derived was used to analyze the inflow into a water reservoir in Iceland from a nearby lavafield, and the runoff is compared with flow data. (Knapp-USGS)
W73-12723

ARTIFICIAL RECHARGE OF GROUNDWATER AND INFILTRATION BASINS (ISKUSSTVENNOYE VOSPOLNENIYE ZAPASOV I INFIL'TRATSIONNYYE VODOZABORY PODZEMNYKH VOD),
For primary bibliographic entry see Field 04B.
W73-12745

SILICA IN THERMAL AND COLD WATERS (KREMNEZEM V TERMAL'NYKH I KHOLODNYKH VODAKH),
For primary bibliographic entry see Field 02K.
W73-12751

WATER LEVELS NEAR A WELL DISCHARGING FROM AN UNCONFINED AQUIFER,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-12777

NEW APPLICATIONS OF GEOPHYSICAL METHODS TO GROUND-WATER PROBLEMS IN PENNSYLVANIA,
Pennsylvania State Univ., University Park.
K. H. Merkel, S. S. Alexander, R. J. Greenfield, and P. M. Lavin.
Earth and Mineral Sciences, Vol 41, No 5, p 33-37, February 1972. 4 fig, 7 ref.

Descriptors: *Borehole geophysics, Electric well logging, Electrical studies, *Resistivity, Aquifer characteristics, *Water pollution sources, Wells, *Mine water, *Pennsylvania, Landfills.
Identifiers: *Fracture traces, Fluid saturated soil layer, Zone of mineralization, Primary flow chemicals.

Traditionally, geophysical exploration has been associated mainly with the petroleum and mining industries. The use of seismic, gravity and magnetic exploration methods in the search for oil and gas, and the use of electric, magnetic and gravity techniques in the search for metallic mineral deposits are well established. To a lesser extent, various geophysical surveying procedures have been applied to ground-water exploration; recently, fostered by increased consumption of resources and greater awareness for environmental problems, new problems have arisen which have led to new and more sophisticated applications of geophysical techniques. Case studies are presented on the use of geophysical techniques in the areas of direct and indirect ground-water source exploration, location of sources of acid mine drainage and other ground water pollutants. Emphasis is placed on the development of new procedures introduced to overcome some of the problems which have limited the applications of conventional geophysical methods utilized in shallow depth exploration in the past. (Campbell-NWWA)
W73-12783

EVALUATION OF A SHALLOW LEAKY WATER TABLE AQUIFER IN A SUBHUMID REGION OF FRANCE,
M. A. Saint-Pe.
Ground Water, Vol 11, No 4, p 23-39, July-August 1973. 5 fig, 6 ref.

Descriptors: *Hydrogeology, *Groundwater resources, Water table, Groundwater movement, Water balance, Evapotranspiration, Recharge, Discharge (Water), Water yield, Drainage.
Identifiers: *Leaky aquifers, France.

The Arcachon Bay Plio-Quaternary aquifer, located in a flat poorly drained region of France, receives 1 m annual precipitation, and has a shallow water table. It is composed of a 50-100 m thick body of well-sorted clean sand and gravel which has excellent hydrodynamic properties and much fresh groundwater in storage. Leakage to the underlying Miocene aquifer, inferred from geologic and hydrogeologic observations, was calculated by water budgeting and Darcy's law to be on the order of 1.5 cu m/sec. This rate, about 15% of the annual precipitation, is nearly half the recharge rate to the Plio-Quaternary aquifer. Recharge amounts to more than 35% of the annual precipitation. The evapotranspiration rate, based on Thornthwaite's method, is more than 55% of the

annual precipitation. High recharge and evapotranspiration rates, a direct consequence of the relief, permeability of soils, and occurrence of hot summers, are coupled with a low surface runoff. The aquifer is excellent for irrigation and water-supply purposes. Drainage improvement is needed for extensive farming of the lands. (Knapp-USGS)
W73-12941

AN APPROACH TO HYDROGEOLOGIC INVESTIGATIONS OF RIVER ALLUVIUM BY THE USE OF COMPUTERIZED DATA PROCESSING TECHNIQUES,
Oklahoma State Univ., Stillwater. Dept. of Geology.
For primary bibliographic entry see Field 02A.
W73-12942

HYDRAULICS OF SHEETLIKE SOLUTION CAVITIES,
Geological Survey, Bay St. Louis, Miss. Gulf Coast Hydroscience Center.
For primary bibliographic entry see Field 04B.
W73-12944

2G. Water in Soils

AQUEOUS IRON-SULFUR SYSTEMS IN RICE FIELD SOILS OF LOUISIANA,
Alabama Univ., Birmingham. Inst. of Dental Research.
For primary bibliographic entry see Field 03F.
W73-12385

PROBLEMS IN THE PRODUCTION OF A SPRING FLOOD (VOPROSY FORMIROVANIYA VESENNEGO POLOVOD'YA).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 04A.
W73-12435

INVESTIGATION OF THERMAL PROPERTIES OF SOILS IN THE DON RIVER BASIN FOR ESTIMATION OF SNOWMELT LOSSES TO INFILTRATION INTO FROZEN SOIL (ISSLEDOVANIYE TEPLOVYKH SVOYSTV POCHV BASSEYNA R. DONA DLYA OTSENKI POTER' TALYKH VOD NA IN FIL'TRATSIYU V MERZLUYU POCHVU),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
Ye. F. Golitsyna, I. L. Kalyuzhnyy, K. K. Pavlova, and V. V. Romanov.
In: Voprosy formirovaniya vesennego polovod-'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 3-21, Leningrad, 1972. 6 fig, 4 tab, 16 ref.

Descriptors: *Soils, *Frozen soils, *Thermal properties, *Snowmelt, *Infiltration, Water loss, Moisture deficit, Soil moisture, Moisture content, Temperature, Thermal conductivity, Ice, Chernozems, Forest soils, Soil properties, Equations.
Identifiers: USSR, *Don River, Nomograms.

Data are presented on thermal properties of Don soils and on the phase composition of water in these soils in the frozen state. The process of infiltration is examined in terms of the mechanism of interaction of snowmelt with frozen soil, and the thermophysical method used to compute water losses to infiltration is reduced to practical use. In loam Chernozems of the Don River basin, intense phase transitions are generally observed at temperatures ranging from 0 to minus 3 deg C, while at temperatures below minus 5 deg C, the change in the ratio of ice to unfrozen water is negligible. At temperatures between minus 15 and minus 20 deg C, the amount of unfrozen water in Chernozems is 10%-16% of the weight of dry soil. (See also W73-12435) (Josefson-USGS)
W73-12436

LABORATORY INVESTIGATIONS OF THE TRANSMISSION CAPACITY OF FROZEN AND THAWED SOILS BASED ON DATA OF THE VALDAY FIELD LABORATORY (VNIGL) (LABORATORNYYE ISSLEDOVANIYA VODOPROPUSKNOY SPOSOBNOSTI MERZLYKH I TALYKH POCHVO-GRUNTOV (PO MATERIALAM MERZLOTHOY LABORATORII VNIGL)),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. A. Kapotov.
In: Voprosy formirovaniya vesennego polovod-'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 22-45, Leningrad, 1972. 6 fig, 2 tab, 11 ref.

Descriptors: *Laboratory tests, *Frozen soils, *Thawing, *Infiltration, *Percolation, Hydraulic conductivity, Permeability, Porosity, Soil moisture, Moisture content, Temperature, Heat, Freezing, Melt water, Bound water, Loam, Chernozems, Curves, Equations, Laboratory equipment.
Identifiers: USSR, *Valday Field Laboratory, *Transmission capacity.

Investigations were conducted at the Valday Field Laboratory in 1968-71 to measure infiltration and percolation of water into thawed and frozen sandy and Chernozem loam soils. Large infiltration and percolation values were recorded in experiments at temperatures ranging from minus 3.0 to 3.5 deg C in upper layers of a sandy soil wetted to minimum moisture capacity. Similar results were obtained in experiments with Chernozem loam soils at temperatures ranging from minus 2.2 to 2.4 deg C. The data obtained can be used to assess the importance of factors which determine infiltration capacity of soils. (See also W73-12435) (Josefson-USGS)
W73-12437

PRINCIPLES FOR ESTIMATING AND FORECASTING WATER LOSSES IN SPRING ON WATERSHEDS IN NORTHWESTERN EUROPEAN USSR (PRINTSIPY OTSENKI I PROGNOZA POTER' VESENNIKH VOD NA VODOSBORAKH SEVERO-ZAPADA YETS),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
O. I. Krestovskiy.
In: Voprosy formirovaniya vesennego polovod-'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 46-61, Leningrad, 1972. 7 fig, 3 tab, 30 ref.

Descriptors: *Water loss, *Water storage, *Watersheds (Basins), *Estimating, *Forecasting, Recharge, Groundwater, Water balance, Precipitation (Atmospheric), Evaporation, Runoff, Floods, Lakes, Bogs, Soils, Spring, Curves, Equations.
Identifiers: European USSR.

Fundamental principles for estimating absorptive capacity of watersheds were based on analysis of long-term observation data on components in the water balance of river basins in northwestern European Russia for fall, winter, and spring seasons of the year. Methods are proposed for forecasting water losses to basin recharge during periods of spring floods. The principles examined are generally applicable to other forested regions in the area. (See also W73-12435) (Josefson-USGS)
W73-12438

RESULTS OF A STUDY OF WATER REGIME OF SOILS ON SMALL WATERSHEDS IN THE DON RIVER BASIN (REZUL'TATY IZUCHENIYA VODNOGO REZHIMA POCHV MALYKH VODOSBOROV V BASSEYNE R. DONA),
Gosudarstvenni Gidrologicheskii Institut, Leningrad (USSR).
Ye. A. Leonov, and N. Ye., Leonova.
In: Voprosy formirovaniya vesennego polovod-'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 133-154, Leningrad, 1972. 4 fig, 4 tab, 13 ref.

Descriptors: *Soil moisture, *Water storage, *Small watersheds, Moisture content, Snow surveys, Antecedent moisture content, Field capacity, Variability, Equations.
Identifiers: USSR, *Don River.

Studies were made of water regime of soils on small watersheds in the Don River basin to Kazanskaya Station between August 1969 and May 1971. Large temporal and spatial variability of soil moisture storage is due to a great diversity of physiographic conditions in the basin. Standard deviation of spatial variability of moisture storage in the top meter layer of soil for small watersheds of the Central Russian upland for winter and spring periods is 65-70 mm, and the coefficient of variation is 0.19-0.20. Standard deviation of spatial variability of soil moisture on 3-km snow courses with homogeneous soils is 15-20 mm, and the coefficient of variation is 0.04-0.07. For snow courses with heterogeneous soils, standard deviation is 25-77 mm, and the coefficient of variation is 0.06-0.21. The present basin network of 29 stations under supervision of the Administration of the Hydrometeorological Service of the Central Black Earth region does not provide for uniform distribution of stations for observation of major soil groups or for sufficiently accurate determination of average basin moisture storage. To improve the determination accuracy, soil moisture observations must be expanded to include villages of Russkaya Zhuravka, Istobnoye, Gremyach'ye, Demshinsk, Volchek, Terbuny, and Bogoyavlensk and towns of Bobrov, Georgiu-Dezh, and Zadonsk. (See also W73-12435) (Josefson-USGS)
W73-12441

SOME HYDROPHYSICAL CHARACTERISTICS OF SOILS IN THE DON RIVER BASIN TO KAZANSKAYA STATION (NEKOTORYYE VODNO-FIZICHESKIYE KHARAKTERISTIKI POCHV BASSEYNA R. DONA DO ST-TSY KAZANSKOY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
Ye. A. Leonov, and N. Ye. Leonova.
In: Voprosy formirovaniya vesennego polovod-'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 183-207, Leningrad, 1972. 3 fig, 13 tab, 15 ref.

Descriptors: *Soils, *Soil physical properties, *Hydrologic properties, *Bulk density, *River basins, Small watersheds, Soil moisture, Moisture content, Wilting point, Particle size, Porosity, Water storage, Chernozems, Forest soils, Grasslands.
Identifiers: USSR, *Don River, Hygroscopicity, Solonetzes.

To study hydrophysical properties of dominant and subsidiary soils in the Don River basin to Kazanskaya Station, 101 bulk-density determinations were made in 1969-71 at 44 stations in 8 small watersheds. Average bulk-density values for dominant soils increase in a southerly direction, with lowest values in the top-meter layer observed in podzolized and leached Chernozems and highest values in southern Chernozems. In each soil region, bulk density of the dominant soils is lower than bulk density of the subsidiary soils, the difference in the top-meter layer reaches 0.40-0.50 g/cu cm. Bulk-density values for gray and dark-gray Forest soils on Chernozem and for Chernozems beneath forest plantings differ little from

those for dominant soils of the corresponding region. (See also W73-12435) (Josefson-USGS)
W73-12443

METHODS OF DETERMINING SOIL MOISTURE STORAGE IN WINTER (K METODIKE OPREDELENIYA VLAGOZAPASOV POCHVY V ZIMNIY PERIOD GODA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
L. K. Vershinina, and N. A. Ivanova.
In: Voprosy formirovaniya vesennego polovod-'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 208-217, Leningrad, 1972. 4 fig, 2 tab, 9 ref.

Descriptors: *Soil moisture, *Water storage, *Winter, Moisture content, Field capacity, Bulk density, Water equivalent, Ice, Runoff, Frozen soils, Thawing, On-site investigations, Snow surveys.
Identifiers: USSR, *Bityug River.

Determinations of soil bulk density and moisture storage were based on data of on-site investigations by the State Hydrologic Institute in the Bityug River basin in Voronezh Oblast in the winter of 1968-69. Errors in the determination of moisture storage of frozen soils were estimated on the basis of bulk density of thawed soils. To determine moisture storage of frozen soils in the region, the relation of bulk density of thawed and frozen soils to moisture content should be used. (See also W73-12435) (Josefson-USGS)
W73-12444

TIME EFFECTS ON DYNAMIC SHEAR MODULUS OF CLAYS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. F. Marcuson, III, and H. E. Wahls.
J Soil Mech Found Div, Am Soc Civ Eng, Vol 98, No SM12, p 1359-1373, Dec 1972. 9 fig, 1 tab, 19 ref, 2 append

Descriptors: *Soil dynamics, Clays, Time, *Soil tests, Soil properties, Soil mechanics, Equations, Dynamics, Bibliographies.
Identifiers: *Shear modulus, Dynamic response, Dynamic tests, Test results.

The dynamic properties of soils are needed for computing response to seismic forces. A Hardin oscillator was used to apply a steady-state, torsional vibratory load to remolded specimens of kaolinite and calcium bentonite inside a triaxial chamber and under an isotropic consolidation pressure. Principles of the resonant column test were used to determine dynamic shear modulus. After completing primary consolidation, the response was studied as a function of time for both drained and undrained conditions. Regression analyses were performed on these data and relationships are presented that show the effects of void ratio, effective stress, and time on the dynamic response of the 2 clays. The shear modulus increases with: (1) increasing pressure, (2) decreasing void ratio, and (3) time, for both materials. This increase was approximately 5% for kaolinite and 25% for bentonite per logarithmic cycle of time after completion of primary consolidation in constant effective stress undrained tests. (USBR)
W73-12477

IMPROVEMENTS IN MOVING SPRINKLER IRRIGATION SYSTEMS FOR CONSERVATION OF WATER,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W73-12507

THEORY OF WATER MOVEMENT IN SOILS: 10. CAVITIES WITH CONSTANT FLUX,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
J-Y. Parlange.
Soil Science, Vol 116, No 1, p 1-7, July 1973. 14 ref.

Descriptors: *Soil water movement, *Pores, Porosity, Interstices, Mathematical studies, Equations, Porous media, Hydraulic conductivity, Diffusivity, Infiltration, Flow.

Analytical expressions are derived for the absorption of water from cylindrical and spherical cavities when the flux of water at the cavity is imposed. The solution reduces to the one-dimensional case in the short time limit. The soil around the cavity may become saturated; the growth of the saturated region with time is described. Correction terms due to gravity are also derived for the case of a spherical cavity. (See also W73-05099) (Knapp-USGS)
W73-12600

ERODIBILITY OF HILL SOILS OF SUTLEJ CATCHMENT AREA IN HIMACHAL PRADESH,
Indian Agricultural Research Inst., New Delhi. Div. of Soil Science and Agricultural Chemistry.
For primary bibliographic entry see Field 02J.
W73-12635

EFFECTS OF AIR GAPS AND SATURATED VOIDS ON ACCURACY OF NEUTRON MOISTURE MEASUREMENTS,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
B. Z. Richardson, and E. R. Burroughs, Jr.
U S For Serv Res Pap Int. 120. p 1-20. 1972. Illus.
Identifiers: *Air gaps, *Measurements, Moisture, Sand, Saturated, Voids, *Soil moisture.

The effects of voids on the accuracy of neutron soil moisture measurements in coarse and fine sand were investigated utilizing 2 25-cubic-foot plastic tanks. Test voids 3 inches and 6 inches in diameter and 10 inches long were cut from aluminum tubing and fastened to the neutron access tube in each tank. Voids in the control tank were filled with sand; those in the test tank were left empty. The amount of water which was added or subtracted was measured by weighing each tank. The difference in neutron measurements between the 2 tanks with the water at a given level measures the effects of the voids. A maximum error of +55% moisture by volume was caused by the large void in coarse sand with the void saturated; with the void drained, the error was -12.3% moisture. Errors in fine sand were slightly less than those in coarse sand; and errors due to the small void were about 1/3 the magnitude of errors due to the large void. Graphs were developed for use in estimating the size of voids adjacent to access tubes and in calculating the probable magnitude of measurement errors due to these voids when using field data.--Copyright 1973, Biological Abstracts, Inc.
W73-12636

APPLICATION OF ACRYLIC PLASTIC TENSION LYSIMETERS TO SLOPING LAND,
British Columbia Univ., Vancouver. Dept. of Soil Science.
W. W. Bourgeois, and L. M. Lavkulich.
Can J Soil Sci. Vol 52, No 2, p 288-290. 1972. Illus.
Identifiers: *Lysimeters, *Sloping land, Instrumentation, *Soils.

A lysimeter was developed with a desirable hydraulic contact between the extracting plate and the soil, using silicon carbide powder. A detailed description of the materials and construction is provided.--Copyright 1973, Biological Abstracts, Inc.
W73-12638

THE EFFECT OF ADSORBENTS ON THE RATE OF DEGRADATION OF HERBICIDES INCUBATED WITH SOIL,
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
For primary bibliographic entry see Field 05B.
W73-12656

FACTORS AFFECTING THE PERCOLATION TEST,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-12716

INFLUENCE OF MOISTURE REGIME ON THE GENESIS OF LATERITE SOILS IN SOUTH INDIA: II. CLAY COMPOSITION AND MINERALOGY,
Indian Agricultural Research Inst., New Delhi.
A. S. Gowaikar.
J Indian Soc Soil Sci. Vol 20, No 1, p 59-66. 1972. Illus.
Identifiers: *Clay composition, Genesis, *India, Mineralogy, Soil moisture, Rainfall, *Soils (Laterite).

The chemical composition of the clay fractions indicates reduction in SiO_2 and increase in Fe_2O_3 and Al_2O_3 with increase in rainfall. The clay minerals present are dominated by kaolinite under all moisture regimes. Quartz is also noted in small quantities in all clay fractions irrespective of the climatic conditions. Gibbsite occurs both in high and excessive rainfall groups. Laterization process is enhanced with high and excessive rains in 7 mo. having a K index > 1. With high rains distributed over a period of 9 mo., the laterization process is retarded. A dry spell of about 5 mo. (K index < 1) appears to be essential for laterization. (See also W73-04605)--Copyright 1973, Biological Abstracts, Inc.
W73-12721

CHARACTERISTICS OF WATER MIGRATION IN A THICK LEACHED CHERNOZEM (OSOBENNOSTI DVIZHENIYA VODY V VYSHCHELOCHENNOM MOSHCHNOM CHERNOZEME),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Maslichnykh i Efiromaslichnykh Kultur, Krasnodar (USSR).
P. G. Semikhnenko, and V. I. Kondrat'yev.
Pochvovedeniye, No 6, p 69-74, June 1972. 1 fig, 4 tab, 7 ref.

Descriptors: *Soil physics, *Soil water movement, *Soil moisture, *Chernozems, Capillary action, Diffusion, Evaporation, Water loss, Precipitation (Atmospheric), Soil management.
Identifiers: *USSR (Krasnodar Territory-Kuban').

Results are presented of experiments performed in the Kuban' region (Krasnodar Territory) in 1966-69 on low-humic, thick-leached Chernozems formed on calcareous loesslike loam. The capillary rise of water to the surface of this soil does not compensate for water losses through evaporation. Capillary flow to the soil surface is observed only during the first days of spring and after abundant precipitation when soil water content approaches minimum moisture capacity. The upper (2-4 cm) layer of well-structured soils dries rapidly to discontinuous capillary moisture or less and acts as a mulch. From the first days of spring the evaporation zone moves downward, and water losses during the presowing period are determined mainly by vapor migration through diffusion. (Josefson-USGS)
W73-12743

HYDROPHYSICAL PROPERTIES AND WATER REGIME OF CRIMEAN SOUTHERN CHERNOZEMS IN A FIELD CROP ROTATION (VOD-

NO-FIZICHESKIYE SVOYSTVA I VODNYY REZHIM YUZHNYKH CHERNOZEMOV KRYMA V POLEVOM SEVOOBOROTE),
Krymskii Selskokhozyaistvennyi Institut, Simferopol (USSR).
G. S. Smorodin, and V. V. Parshikov.
Pochvovedeniye, No 6, p 57-68, June 1972. 2 fig, 7 tab, 8 ref.

Descriptors: *Soil physical properties, *Hydrologic properties, *Chernozems, *Rotations, *Field crops, Crop production, Plant growth, Soil-water-plant relationships, Root zone, Soil water, Soil moisture, Available water, Permeability, Evapotranspiration, Water loss, Clays, Loam, Particle size.
Identifiers: *USSR (*Crimea).

For many years technologically advanced kolkhozes and sovkhozes in the Crimea have obtained high yields of winter wheat and barley, amounting to 35-45 cntr/ha. To determine the causes of these yields, investigations were carried out in 1966-69 to study hydrophysical properties and moisture conditions of southern Chernozems in the Crimean piedmont-steppe zone. These soils have a high moisture capacity and permeability, a high available-water content (300-360 mm in the 0- to 200-cm layer), and a relatively high content of water-stable aggregates. Agroclimatic conditions contribute to deep soil wetting in fall and winter (to a depth of 200 cm or more). Loss of soil water by evaporation is high (5.2 to 7.4 mm/day), especially in summer when soil water content is optimal and plant growth is intense. Evaporation from bare soil may reach 1.3 mm/day. Total loss of water by field crops may exceed soil evaporation fivefold to sixfold. (Josefson-USGS)
W73-12744

WATER REGIME IN A CROP ROTATION ON CHERNOZEM SOILS IN SOUTHEAST RUSSIA (VODNYY REZHIM V SEVOOBOROTE NA CHERNOZEMNYKH POCHVAKH YUGO--VOSTOKA),
A. M. Byalyy.
Gidrometeoizdat, Leningrad, 1971. 232 p.

Descriptors: *Soil water movement, *Soil moisture, *Chernozems, *Rotations, *Soil-water-plant relationships, Soil management, Soil temperature, Root zone, Available water, Evapotranspiration, Wilting point, Water utilization, Water loss, Water supply, Water balance, Precipitation (Atmospheric), Condensation, Snow, Runoff, Shelterbelts.
Identifiers: *European USSR, Hygroscopicity.

Water regime of Chernozem soils in southeastern regions of European Russia was investigated for relationships between incoming and outgoing items in the water balance and for characteristics of water supply and use as they affect plant growth in different crop rotation fields. Studies are made of soil moisture conditions in forests, shelterbelts, and open fields between trees, and principal factors in the regulation of the water regime of Chernozems are described. A comprehensive bibliography of Soviet references is supplied. (Josefson-USGS)
W73-12747

DETERMINATION OF EXCHANGEABLE CATIONS IN CALCAREOUS SOILS,
Centro de Edafologia y Biologia Aplicada del Segura, Murcia (Spain).
O. Carpena, A. Lax, and K. Vahtras.
Soil Science, Vol 113, No 3, p 194-199, March 1972. 3 fig, 2 tab, 6 ref.

Descriptors: *Cation exchange, *Calcareous soils, *Calcium carbonate, *Magnesium carbonate, *Alkaline earth metals, Soil analysis, Soil chemistry, Soil investigations, Leaching, Solvent extractions.
Identifiers: *Spain (Murcia).

This investigation attempted to eliminate solubilization of carbonates as a source of interference in the determination of exchangeable cations in calcareous soils. All procedures for determining exchangeable cations in calcareous soils have the problem of interference of alkali-earth metals dissolved from carbonates, which are exchangeable cations. In 1953, Mehlich introduced a procedure which determines the exchangeable cations in calcareous soils by measuring the calcium and magnesium dissolved from soil carbonates when the soils were extracted with reagents. This procedure is most appropriate for these soils, because the solubility of carbonates is lower in this extractant than in any other. The results are amply supported with tables and graphs. (Bahre-Arizona)
W73-12786

LEACHING SALTY SOILS,
Central Soil Salinity Research Inst., Karnal (India).
I. P. Abrol, and D. R. Bhumbla.
Indian Farming, Vol 22, No 1, p 10-11, 1972. 4 fig.

Descriptors: *Leaching, *Gypsum, *Permeability, *Land forming, *Saline soils, Drainage, Ponding, Farm ponds, Root zone, Soil moisture, Soil amendments, Crop response, Alkaline soils.
Identifiers: *India (Haryana-Punjab-Pradesh).

Uncultivated lands in the states of Haryana, Punjab and Uttar Pradesh in India, contain excess salts and sodium, and unless removed from the soil, crop response is likely to be poor. The ideal method for removal of salts is to provide drainage in the root zone so that salts can be removed by a drainage system to the sea. Leaching of salts to lower soil layers can be accomplished by ponding water on the soil surface preceding the rainy season. This is the time when maximum salts are on the soil surface and the groundwater table is deepest. The relatively dry soil ensures a high level of soil permeability so that water is not lost by evaporation. Impermeable soils are aided by the addition of gypsum which facilitates water penetration and therefore salt leaching. It is suggested for this area that nearby canal water be used because of its good quality, and if not available, tubewells should be installed. (Bahre-Arizona)
W73-12789

AUGER SOIL SAMPLER FOR HERBICIDE RESIDUES,
Agricultural Research Service, College Station, Tex. Plant Science Research Div.
T. O. Flynt, T. E. Riley, R. W. Bovey, and R. E. Meyer.
Weed Science, Vol 19, No 5, p 583-587, September 1971. 2 fig.

Descriptors: *Sampling, *Soil moisture, *Soil analysis, *Herbicides, Soil investigations, *Instrumentation, Soil tests, *Texas, Soil types.

A soil sampler was constructed for moisture and pesticide residue determinations that will retrieve soils with rocky and heavy clay layers from Texas rangeland. A commercially constructed worm-gear driven auger was mounted in a 3.7-m-tall vertical rectangular frame supported by a 4.6-m-long A-frame attached to the rear bumper of a truck. A cable attached from the bed of the truck to the top of the frame permits the entire assembly to be raised off the ground with a hand lift hoist when moving from plot to plot. The power unit for the auger was suspended halfway from the A-frame with a flat metal bar. A cable from this suspension bar to a guide platform on the vertical frame prevents any stress on the flexible shaft from the motor to the worm gear drive on the auger. The depth, speed, accuracy and ease of sample retrieval were substantially increased, compared to manual sampling. (Gloyd-Arizona)
W73-12794

SODIUM-AFFECTED SOILS IN THE JORDAN VALLEY,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Div. of Soil Physical Chemistry.
N. Alperovitch, and J. Dan.
Geoderma, Vol 8, No 1, p 37-57, August 1972. 5 fig, 24 ref.

Descriptors: *Water table, *Water levels, *Soil types, *Saline soils, *Alkaline soils, Aeolian soils, Alluvium, Bogs, Soil tests, Salts, Sodium, Soil classification, Groundwater availability, Leaching, Precipitation (Atmospheric).
Identifiers: *Jordan Valley.

Formation of fine-textured aeolian, alluvial and swampy soils, found both on the present depositional surfaces and the older dissected terrace, is presented to illustrate in part the quaternary history of the region. High water tables affect the salinity and high levels of exchangeable sodium in soils, while some older soils are believed to have been subject to prolonged deposition of airborne salts. In the northern part of the Jordan valley, four soils are common: (1) soils with high groundwater table with the highest concentration of salts and exchangeable sodium in the upper layers; (2) soils with a somewhat deeper water table where the high salinity and alkalinity are in deeper layers; (3) soils which had high groundwater tables in the past, but which have been leached to some extent; and (4) soils which did not have a high water table, but nevertheless are alkaline, also somewhat saline in the deeper layers. The aforementioned soils, except (1) have been subject to some leaching. In the southern part of the valley, most of the soils are highly saline, and the low rainfall precludes natural leaching. Major characteristics of the soils are related to high salinity and high levels of exchangeable sodium. (Bahre-Arizona)
W73-12795

THE EFFECT OF SOIL TEMPERATURE ON PLANTS GROWN IN SALINE SOIL,
Hebrew Univ., Rehovot (Israel). Dept. of Soil Science.
S. Ravikovitch, and J. Navrot.
Soil Science, Vol 113, No 6, p 431-439. 1972. 5 fig, 1 tab, 17 ref.

Descriptors: *Soil temperature, *Saline soils, *Plant growth, Soil tests, Temperature control, Nutrient requirements, Soil-water-plant relationships, Field crops, Phosphorus, Nitrogen, Soil treatment, Soil moisture.

Saline and nonsaline soils and phosphorus fertilization were used in a study of the influence of soil temperature on growth. Soil temperatures were maintained by placing pots in thermostatically controlled water baths at ambient temperatures, 15, 25, 35, and 43C. The experiment also included nutrient treatments in which nitrogren was kept constant for each crop with various levels of phosphorus being applied. Potassium was given at a constant rate in all treatments. The effect of soil temperature was most marked in plants growa in nitrogen-phosphorus-treated soils. Growth was especially stimulated by NP treatments with a high P level. Optimum soil temperature for plant growth was 25C for clover, 35C for corn. For millet it was 35C in saline soil and 43C in nonsaline soil. At all soil temperatures, the Cl content of plants growing in saline soils decreased with an increase in the P application. With increasing salinity, there was an increase in plant phosphorus content. (Bahre-Arizona)
W73-12797

EFFECT OF LEVEL OF SOIL MOISTURE ON NITROGEN MINERALIZATION AND NITRIFICATION DURING INCUBATION OF EAST PAKISTAN TEA SOILS,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
For primary bibliographic entry see Field 03F.

W73-12799

SIGNIFICANCE OF HEATING AGRICULTURAL SOILS,
Indian Inst. of Science, Bangalore. Dept. of Biochemistry.
For primary bibliographic entry see Field 03F.
W73-12802

NOMOGRAPH FOR THE SATURATION PERCENTAGE OF SOIL,
A. Zanker.
Soil Sci. Vol 113, No 5, p 373-374. 1972. Illus.
Identifiers: Nomograph, *Saturation (Soils), *Soil water.

Among the methods for soil water saturation determination, the one proposed by Wilcox is the simplest, and gives very accurate results. A nomograph is presented, which allows calculation of the soil water percentage by the Wilcox method in a few seconds.--Copyright 1973, Biological Abstracts, Inc.
W73-12807

NOMOGRAPH FOR HYDRAULIC CONDUCTIVITY AND INTRINSIC PERMEABILITY OF WATER-SOIL SYSTEM,
A. Zanker.
Soil Sci. Vol 113, No 5, p 375-377. 1972. Illus.
Identifiers: *Hydraulic conductivity, Nomograph, *Permeability, *Soil-water system.

The hydraulic conductivity and intrinsic permeability of soil to water are functions of the length of soil column, volume of percolate in a given time, cross-sectional area of soil column, difference of hydraulic head and temperature of water. The calculation of those properties is rather troublesome and time-consuming. A nomograph is presented which allows calculation of both properties in a few seconds.--Copyright 1973, Biological Abstracts, Inc.
W73-12808

RAPID FIELD DETERMINATION OF NITRATE IN NATURAL WATERS,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 02K.
W73-12810

MORPHOLOGY, GENESIS, OCCURRENCE AND AGRICULTURAL POTENTIAL OF ACID SULPHATE SOILS IN CENTRAL THAILAND,
Food and Agriculture Organization of the United Nations, Bangkok (Thailand). Soil Survey Land Classification Project.
W. Van Der Kevie.
Thai J Agric Sci. Vol 5, No 3, p 165-182, 1972, Illus.
Identifiers: *Acid soils, Agricultural, Genesis, Morphology, Soils, *Sulfate soils, *Thailand.

An area of 800,000 ha consists of acid sulfate soils. They are poorly drained, strongly acid, heavy clay soils, and subject to prolonged flooding during the rainy season. The classification of these soils is discussed. A brief outline of the formation of the marine and brackish water sediments and their approximate age, determined by C 14 dating methods, is given. Soil profile development of younger and older acid sulfate soils is described. The soil potential for agriculture is discussed and possible ways of improvement of these soils are indicated.--Copyright 1973, Biological Abstracts, Inc.
W73-12818

EFFECT OF SOIL MOISTURE ON THE GROWTH OF MACROPHOMINA PHASEOLI, SCLEROTIUM ROLFSII AND FAUSARIUM SOLANI IN SOIL,
Jute Agricultural Research Inst., Barrackpore (India).
For primary bibliographic entry see Field 03F.
W73-12831

FLOW OF MICROBIALLY FIXED NITROGEN IN A MODEL ECOSYSTEM,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05B.
W73-12847

GERMINATION OF WHEAT AS AFFECTED BY SOIL WATER STRESS,
Manitoba Univ., Winnipeg. Dept. of Soil Science.
For primary bibliographic entry see Field 03F.
W73-12884

DETERMINATION OF AMMONIUM IN SOIL EXTRACTS AND WATER SAMPLES BY AN AMMONIA ELECTRODE,
Iowa State Univ., Ames. Dept. of Agronomy.
W. L. Banwart, M. A. Tabatabi, and J. M. Bremmer.
Commun Soil Sci Plant Anal. Vol 3, No 6, p 449-458. 1972. Illus.
Identifiers: *Ammonia electrode, *Ammonium determination, Samples, *Soil extracts.

Interference and recovery tests reported indicate that the Orion ammonia electrode can be used satisfactorily for determination of ammonium in soil extracts and water samples. The electrode method of analysis described is rapid, simple, and precise, and its results agree closely with those obtained by a distillation-titration method of determining ammonium in soil extracts and water samples.--Copyright 1973, Biological Abstracts, Inc.
W73-12939

NITROGEN LOSS FROM FLOODED SOIL,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
W. H. Patrick, Jr., and M. E. Tusneem.
Ecology, Vol 53, No 4, p 735-737, 1972, Illus.
Identifiers: Diffusion, *Flooded soil, Nitrification, *Nitrogen, Soils, Anaerobic conditions.

An appreciable loss of labeled N occurred in flooded soils exposed to atmospheric O2. N added as ammonium was apparently nitrified in the aerobic surface layer of soil and then diffused downward into the underlying anaerobic zone where it was denitrified and lost from the system.--Copyright 1973, Biological Abstracts, Inc.
W73-12967

WATER VAPOR ADSORPTION BY WATER--REPELLENT SOILS AT EQUILIBRIUM,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
S. Miyamoto, J. Letey, and J. Osborn.
Soil Sci, Vol 114, No 3, p 180-184, 1972, Illus.
Identifiers: *Adsorption (Soils), Equilibrium, Repellents, Soils, Temperature, *Water vapor, Wettability, Surface tension.

Water vapor adsorption by soil and sand samples which have different surface tensions were examined at equilibrium under a controlled temperature of 30 plus or minus 0.5C. No specific trend or differences which could be uniquely related to repellency were found on the amount adsorbed/unit area, the shape of adsorption isotherm, the heat of adsorption and the integral free energy of adsorption. The differences in initial vapor adsorption levels under the controlled temperature did not influence the measurable value of the surface tension and consequently repellency of the samples used. Adamson's method to determine the equilibrium contact angle and the spreading coefficient by adsorption isotherm alone appeared not to apply for porous media. The apparent independence of water vapor adsorption upon the differences in surface tension of porous media implied that mechanisms of wettability and repellency of porous media may be occurring at the portion which is beyond the vapor adsorption or masked by other soil properties.--Copyright 1973, Biological Abstracts, Inc.
W73-12968

EDAPHIC AND WATER RELATIONSHIPS OF ALDICARB AND ITS METABOLITES,
North Dakota State Univ., Fargo. Dept. of Entomology.
M. S. Quraishi.
Can Entomol. Vol 104, No 8, p 1101-1196. 1972. Illus.
Identifiers: *Aldicarb, *Edaphic relationships, Light, Metabolites, Potatoes, Roots, Storage, Sun, Temperature, Sugarbeets.

Laboratory investigations were made to determine the persistence of aldicarb and its metabolites in soil (clay loam pH 6.8-7.2) and in water collected from fields. At dose rates of 15 and 20 ppm, aldicarb was not detectable in soil after 8 and 12 wk, respectively. At 50 ppm, after 11 wk chemically detectable amounts of the insecticide were present in the soil. Soil samples were stored between 23 and 28C but temperature at times reached 32C. In field water treated in the laboratory at 100 ppm of aldicarb, the chemical and its metabolites were detectable at 0.4 ppm 11 mo. later. Water was stored at 16-20C and was exposed for 507.5 hr to sunlight. Aldicarb was eluted readily with water from soil columns. When aldicarb was applied as side dressing at the time of planting of sugarbeet roots and potatoes, residues of less than 0.05 ppm were found in soil and potatoes at harvest. One sugarbeet root sample contained 0.2 ppm of the chemical and its metabolites.--Copyright 1973, Biological Abstracts, Inc.
W73-12979

2H. Lakes

THE SEDIMENTS AND HISTORY OF LAKE BUTTE DES MORTS, WISCONSIN,
Wisconsin State Univ., Oshkosh. Limnology Lab.
For primary bibliographic entry see Field 02J.
W73-12355

INVESTIGATIONS ON AMERICAN SHAD IN THE ST. JOHNS RIVER,
R. O. Williams, and G. E. Bruger.
Fla Dep Nat Resour Mar Res Lab Tech Ser. 66. p 1-49. 1972. Illus.
Identifiers: Alosa-Sapidissima, *American shad, Crustaceans, *Florida (St. Johns River), Growth, Insects, Rivers, Shad, *Spawning.

A study of American shad, Alosa sapidissima (Wilson), in the St. Johns River was conducted to determine the spawning grounds, movement, growth, and food habits of juveniles, and to evaluate effects of the fisheries and proposed environmental alterations on the populations. Spawning grounds were located by collecting free-drifting, demersal shad eggs in plankton nets set along the river bottom. Spawning began at Crows Bluff west of DeLand and extended south about 100 mi to USA Highway 192 west of Melbourne, but most spawning occurred between Lakes Monroe and Poinsett. Importance of the spawning area between Lakes Harney and Poinsett increased during low water when there was little current in the area north of Lake Harney. Eggs were generally collected over clean sand bottom of less than 4 m depth and in current of 1-1 1/2 ft/sec. Juvenile movement and growth were determined by monthly collections of young shad with beach seines, plankton nets, and trawls. Movement pat-

terns were related to current and water temperature with downstream movement from spawning grounds to nursery area occurring as water temperatures increased in spring, and emigration from the river occurring when temperatures dropped in late autumn. Growth was more rapid during the 1970 season. Juveniles collected emigrating from the river in 1969 ranged from 69-110 mm FL (fork length). Young shad fed primarily on crustaceans and insect larvae; crustaceans were the dominant food type. Commercial and sport fisheries have changed significantly from accounts given by previous investigators. Production of both fisheries has declined in recent years. Gill nets are the primary commercial gear; haul seines are nearly defunct. There is some evidence of overfishing, especially of female shad. Proposed upper river alterations such as the St. Johns-Indian River Canal and water control projects by the Central and Southern Florida Flood Control District are discussed and evidence is presented that they may reduce future shad runs by eliminating and/or degrading sections of spawning area between Lakes Monroe and Poinsett.--Copyright 1972, Biological Abstracts, Inc.
W73-12370

PREIMPOUNDMENT STUDY OF WEST POINT LAKE, GEORGIA,
Environmental Protection Agency, Athens, Ga. Southeast Water Lab.
For primary bibliographic entry see Field 05C.
W73-12376

NUTRIENT ENRICHMENT AND EUTROPHICATION OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 05C.
W73-12377

GAS PRODUCTION IN SEDIMENTS OF LAKE MENDOTA, WISCONSIN,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 05C.
W73-12378

THE INFLUENCE OF VEGETATION ON THE REDOX PROFILE IN THE SEDIMENT OF GRANE LANGSO, A DANISH LOBELIA LAKE,
Copenhagen Univ., Hillerod (Denmark). Freshwater-Biological Lab.
For primary bibliographic entry see Field 05C.
W73-12379

FINITE ELEMENT SHALLOW LAKE CIRCULATION ANALYSIS,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
R. H. Gallagher, J. A. Liggett, and S. T. K. Chan.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY7, Paper 9855, p 1083-1096, July 1973. 9 fig, 14 ref, append. NSF Grant GK-23992.

Descriptors: *Water circulation, *Lakes, *Finite element analysis, *Lake Ontario, Equations, Mathematical models, Numerical analysis, Currents (Water), Flow.

A finite element formulation is given for the analysis of the wind-driven circulation of homogeneous variable-depth, shallow lakes. The method of weighted residuals is used to transform the governing differential equation to an integral form which in turn is approximated by linear stream function fields in triangular elements. Numerical results are presented for a rectangular basin and for lake Ontario. (Knapp-USGS)
W73-12413

EVALUATION OF ERTS DATA FOR CERTAIN OCEANOGRAPHIC USES,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 07B.
W73-12429

THE SHAGAWA LAKE PROJECT: LAKE RESTORATION BY NUTRIENT REMOVAL FROM WASTEWATER EFFLUENT,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05D.
W73-12520

CRUSTACEAN PLANKTON AND THE EUTROPHICATION OF LAKES IN THE OKANAGAN VALLEY, BRITISH COLUMBIA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 05C.
W73-12624

BIOLOGICAL EFFECTS OF ARTIFICIAL DESTRATIFICATION AND AERATION IN LAKES AND RESERVOIRS-ANALYSIS AND BIBLIOGRAPHY,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-12625

THE FOOD AND FEEDING HABITS OF THE SMALL MORMYRID FISHES OF LAKE VICTORIA, EAST AFRICA,
East African Freshwater Fisheries Research Organization, Jinja (Uganda).
J. Okedi.
Afr J Trop Hydrobiol Fish. Vol 1, No 1, p 1-12. 1971. Illus.
Identifiers: Chironomid, *East Africa feeding habits (Fish), *Fish food, Gnathonemus-Longibarbis, Gnathonemus-Victoriae, Habits, Lakes, Marcusenius-Grahami, Marcusenius-Nigricans, Mormyrid, Petrocephalus-Catostoma, Povilla, *Lake Victoria.

The feeding habits of Gnathonemus longibarbia, G. victoriae, Marcusenius grahami, M. nigricans and Petrocephalus catostoma including the feeding requirements of both adults and immature fish in affluent rivers and swamp pools where spawning takes place were investigated. Seasonality of accumulation of abdominal fat reserves and intensified periods of feeding activity during sexual quiescence contrasted with lessened feeding activity during breeding periods in adult fishes. The quantity of Chironomid and Povilla larvae, which formed the chief food, in the stomachs of the Mormyrids, appeared to be correlated with certain lunar phases.--Copyright 1973, Biological Abstracts, Inc.
W73-12641

THE LAKE CHILWA TILAPIA AND ITS FISHERY,
Chancellor Coll., Limbe (Malawi).
P. R. Morgan.
Afr J Trop Hydrobiol Fish. Vol 1, No 1, p 51-58. 1971. Illus.
Identifiers: Barbus-Paludinosus, Clarias-Mossambicus, *Fishery, Lakes, *Malawi, Tilapia, Tilapia-Shirana, *Lake Chilwa.

Lake Chilwa, a shallow tropical lake in southern Malawi, experiences considerable fluctuations in water level which seriously affect its fishery. Particular attention is drawn to the effects of water level upon the endemic Tilapia shirana chilwae. When the lake level falls drastically, Tilapia is usually the first important commercial fish to suffer, with mass mortalities being recorded on several occasions. Barbus paludinosus, another important species is similarly affected, but the catfish Clarias mossambicus is very resistant to periods of low water. The history of the Tilapia fishery passed through several phases. Between 1960 and 1965 fish exports rose, then declined between 1965 and 1968 when the lake became dry, followed by another rise after 1968 when the lake was reflooded. The instability of the lake and its fishery will probably persist. Schemes for maintaining a more consistent output of fish are discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-12642

THE SIZE AT MATURITY AND BREEDING SEASONS OF SARDINES IN SOUTHERN LAKE TANGANYIKA,
C. M. A. Ellis.
Afr J Trop Hydrobiol Fish. Vol 1, No 1, p 59-66. 1971. Illus.
Identifiers: *Breeding, Lakes, Limnothrissa-Miodon, *Maturity, *Sardines, Seasons, Size, Stolothrissa-Tanganicae, *Lake Tanganyika.

Stolothrissa tanganicae and Limnothrissa miodon showed a marked seasonal shift in the size at which they first became mature, this being lowest during their main breeding seasons. Stolothrissa females were first mature at an annual mean of 75 mm fork length and the males at 70 mm. Limnothrissa females reached maturity at 75 mm and the males at 64 mm. Mature Stolothrissa were found throughout the year with a peak of activity in the dry season between April and July, and during the wet season in Dec.-Jan. Limnothrissa with active gonads were found in Dec.-May with a distinct breeding peak during March-May and Dec.-Jan. Two sampling localities approximately 60 km apart appeared to support different Stolothrissa populations.--Copyright 1973, Biological Abstracts, Inc.
W73-12649

LAKE MOVEMENTS WITH PARTIAL ICE COVER,
Ontario Water Resources Commission, Toronto.
M. D. Palmer, and J. B. Izatt.
Limnol Oceanogr. Vol 17, No 3, p 403-409. 1972. Illus.
Identifiers: *Canada, Currents, *Ice cover, Lakes, Temperature, *Lake Erie.

A recording current meter was operated under a winter ice sheet at Nanticoke, Lake Erie, in 11 m of water at a depth of 3 m from the bottom. Current magnitude and direction and water temperature were measured every 10 min. Current magnitudes up to 1 mo. after the ice sheet formed were similar to measurements made without ice; autovariance density spectra for this period showed energy concentrations at frequencies corresponding to the free oscillation modes of Lake Erie. Several months after the ice had been in place the measured currents were half as fast (3-9 cm/sec) and spectra during this period showed no energy concentrations at Lake Erie oscillation frequencies.--Copyright 1973, Biological Abstracts, Inc.
W73-12663

RADIATION REGIME OF LAKE CHELKAR AND ADJOINING REGIONS (O RADIATSIONNOM REZHIME OZERA CHELKAR I PRILEGAYUSHCHEY K NEMU TERRITORII),
L. S. Aleksandrova.
Vsesoyuznoye Geograficheskoye Obshchestvo Izvestiya, Vol 105, No 1, p 56-61, January-February 1973. 5 fig, 8 tab, 5 ref.

Descriptors: *Lakes, *Radiation, Albedo, Cloud cover, Surfaces, Curves.
Identifiers: *USSR (Aktynbinsk Oblast), *Lake Chelkar.

Radiation regime of Lake Chelkar in the Aktyubinsk Oblast was investigated in actinometric observations performed by the USSR Academy of Science's Laboratory of Limnology in July-August 1965. Daily total radiation values for the lake varied between 359 and 700 cal/sq cm in July and between 254 and 625 cal/sq cm in August. Daily total radiation values for land areas varied between 354 and 703 cal/sq cm in July and between 266 and 638 cal/sq cm in August. Radiation absorbed at the lake's surface was 17.5 kcal/sq cm in July and 15.0 kcal/sq cm in August, while the radiation absorbed at the earth's surface during these periods was 14.3 kcal/sq cm and 12.4 kcal/sq cm, respectively. The portion of radiation absorbed by the lake was 96% and that absorbed by the earth's surface was 70%. Differences in albedo values for lake and earth surfaces are appreciable, amounting to 14%-15%. (Josefson-USGS)
W73-12724

INVESTIGATION OF LAKE-LEVEL FLUCTUATION PATTERNS AND MOISTURE CONDITIONS IN THE MIDDLE AND SOUTHERN URALS (ISSLEDOVANIYE ZAKONOMERNOSTEY KOLEBANIY UROVNYA OZER I UVLAZHNENNOSTI SREDNEGO I YUZHNOGO URALA),
M. A. Andreyeva.
Vsesoyuznoye Geograficheskoye Obshchestvo Izvestiya, Vol 105, No 1, p 51-56, January-February 1973. 4 fig, 4 ref.

Descriptors: *Lakes, Water levels, Water level fluctuations, *Moisture, *Mountains, Air circulation, Cycles, Correlation analysis, Regression analysis, Curves, Equations.
Identifiers: USSR, *Urals.

Clearly expressed 20-25 year cycles are observed in lake-level fluctuations in the Urals. The rising stage lasts 6-7 years, the period of unsteady maximum, 3-4 years, and the declining stage, 10-12 years. Long-term lake-level fluctuations correlate closely with meteorological conditions and especially with total moisture. Average duration of low stages is 12-13 years in the Transurals and 10-12 years in the Cisurals. High stages are of shorter duration, lasting an average of 7-9 years. Coefficients of low stages vary between 0.6 and 0.9 and decrease toward the south and southeast. Coefficients of high stages vary between 1.2 and 2.0, reaching maximum values in the forest-steppe zone of the Transurals. (Josefson-USGS)
W73-12725

MEASUREMENT OF CURRENTS IN THE GREAT LAKES,
Ministry of the Environment, Ottawa (Ontario).
M. D. Palmer.
International Field Year for the Great Lakes Technical Manual Series No 3; Canadian National Committee for the International Hydrological Decade, Ottawa, Canada, 1972. 32 p, 12 fig, 7 plate, 41 ref, 2 append.

Descriptors: *Great Lakes, *Current meters, *Instrumentation, Water measurement, Data collections, Tracers, Water circulation, Limnology, Currents (Water), Telemetry, Remote sensing, Aerial photography.

This manual is directed toward some of the problems encountered in Great Lakes current measurements. Currents can be measured by either placing a current meter at a fixed point, or by tracking the movement of a free object as it is carried by the water. The fixed meter, or Eulerian technique, is particularly useful for the study of the dynamics of water movement. The free-drifter, or Lagrangian technique, is most useful for the study of diffusion and mass transport. To calculate the mean mass flux past a given Eulerian observing station it is necessary to add an additional term, the Stokes Velocity, which depends on the time and distance scales of the fluctuating currents, and may not apply to the shallow near-shore waters. The relation between the mean velocities observed by the two techniques is 3 lagrange ± Euler and Stokes. In general, meters can be classified as to whether or not they record internally, and by the type of current sensor (transducer) used in the device. Lagrangian measurements are historically the oldest type of measurements. In general they consist of tracing the movement of some identifiable marker that is transported by currents. These direct measurements of particle movement are important for determining the characteristics of dispersion or movement of material discharged into a lake. (Knapp-USGS)
W73-12741

ANNOTATED BIBLIOGRAPHY OF LAKE ONTARIO LIMNOLOGICAL AND RELATED STUDIES - VOL I - CHEMISTRY,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
D. Proto, and R. A. Sweeney.
Copy available from G.PO Sup Doc as EP1.23:73-0282, $1.25; microfiche from NTIS as PB-222 302, $1.45. Environmental Protection Agency Ecological Research Series Report EPA-R3-73-028a, March 1973. 102 p, 1 fig. EPA 16120 HVR.

Descriptors: *Lake Ontario, Great Lakes, Limnology, *Instrumentation, *Chemical properties, *Bibliographies, Abstracts.

One hundred eighty-seven (187) papers concerning chemical aspects of Lake Ontario and influent tributaries were reviewed and abstracted. Each paper was cross-indexed by author, geographic area of lake and/or tributary in which study was performed, technique and instrumentation and parameters. In addition, a list of addresses for the authors and agencies was included along with other possibly pertinent references which the authors were not able to secure and review within the time limitations of the grant. (See also W73-12754 and W73-12755) (EPA abstract)
W73-12753

ANNOTATED BIBLIOGRAPHY OF LAKE ONTARIO LIMNOLOGICAL AND RELATED STUDIES - VOL II - BIOLOGY,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
E. P. Downing, J. E. Hassan, and R. A. Sweeney.
Copy available from GPO Sup Doc as EP1.23:73-028b, $2.60; microfiche from NTIS as PB-222 303, $1.45. Environmental Protection Agency Ecological Research Series Report EPA-R3-73-028b, March 1973. 236 p, 1 fig. 16120 HVR.

Descriptors: *Lake Ontario, Great Lakes, Limnology, *Biological properties, *Instrumentation, *Bibliographies, Abstracts.

Five hundred ninty-six (596) papers concerning biological aspects of Lake Ontario and influent tributaries were reviewed and abstracted. Each paper was cross-indexed by author, geographic area of lake and/or tributary in which study was performed, organism, habitat niche and techniques and instrumentation. In addition, a list of addresses for the authors and agencies is included along with other possibly pertinent references which the authors were not able to secure and review within the time limitations of the grant. (See also W73-12753 and W73-12755) (EPA abstract)
W73-12754

ANNOTATED BIBLIOGRAPHY OF LAKE ONTARIO LIMNOLOGICAL AND RELATED STUDIES - VOL III - PHYSICAL,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
J. Baldwin, and R. A. Sweeney.
Copy available from GPO Sup Doc as EP1.23:73-028c, $2.60; microfiche from NTIS as PB-222 304, $1.45. Environmental Protection Agency Ecological Research Series Report EPA-R3-73-028c, March 1973. 207 p, 1 fig. EPA 16120 HVR.

Descriptors: *Lake Ontario, Great Lakes, Limnology, *Instrumentation, *Bibliographies, *Physical properties, Abstracts.

Four hundred thirty-nine (439) papers concerning physical aspects of Lake Ontario and influent tributaries were reviewed and abstracted. Each paper was cross-indexed by author, geographic area of lake and/or tributary in which study was performed, parameters, techniques and instrumentation. In addition, a list of addresses for the authors and agencies was included along with other possibly pertinent references which the authors were not able to secure and review within the time limitations of the grant. (See also W73-12753 and W73-12754) (EPA abstract)
W73-12755

NITRIFICATION IN SEDIMENTS OF SELECTED WISCONSIN LAKES,
Wisconsin Univ., Madison. Dept. of Soil Sciences.
For primary bibliographic entry see Field 05C.
W73-12763

EXPLORATORY BOTTOM TRAWLING IN LAKE VICTORIA,
Food and Agriculture Organization of the United Nations, Jinja (Uganda). Lake Victoria Fisheries Research Project.
E. Bergstrand, and A. J. Cordone.
Afr J Trop Hydro-Biol Fish. Vol 1, No 1, p 13-23. 1971. Illus.
Identifiers: Bagrus-Docmac, Bottom trawling, Clarias-Mossambicus, *Haplochromis, Lakes, Protopterus-Aethiopicus, Tilapia-Esculenta, *Trawling, *Lake Victoria.

The first lakewide exploratory bottom-trawl survey of Lake Victoria was initiated in Sept. 1968 and terminated in May 1970. Gear experimentation was completed in 1968 and fullscale fishing started in Jan. 1969. Excluding the experimental phase; 841 drags were made which yielded 272,980 kg of fish. Total trawling time was 1117 hr and the distance covered by the trawl approximated 6209 km. The overall hourly catch rate was about 244 kg. Codends of various mesh sizes were employed but the 2 sizes used most often measured 6.4 and 3.8 cm (stretch measure). Catch rates were inversely correlated with mesh size. The catch was dominated by Haplochromis species which constituted 54.3% by weight of the total. Bagrus docmac contributed 11.7% and Clarias mossambicus 10.4%. Other important species weightwise were Protopterus aethipicus and Tilapia esculenta. Species hourly catch rates and percentage frequency of occurrence are presented for each of the 8-10-m depth intervals.—Copyright 1973, Biological Abstracts, Inc.
W73-12803

BENTHIC INVERTEBRATES IN LAKE ASHTABULA RESERVOIR, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-12863

CHEMISTRY AND TROPHIC STATUS OF SEVEN NEW ZEALAND LAKES,
Department of Scientific and Industrial Research, Taita (New Zealand). Soil Bureau.
For primary bibliographic entry see Field 05C.
W73-12928

AGE, GROWTH REPRODUCTION, AND FOOD OF THE BURBOT, LOTA LOTA (LINNAEUS), IN SOUTHWESTERN LAKE SUPERIOR,
Fish and Wildlife Service, Ashland, Wis.
M. M. Bailey.

Trans Am Fish Soc. Vol 101, No 4, p 667-674. 1972. Illus.
Identifiers: Age, *Burbot, Food, Growth, *Lake Superior, Lota-lota, Mysis, Pontoporeia, Reproduction.

This study was based on 1285 L. lota collected in 3 areas in southwestern Lake Superior in 1966-69. Age was determined from otoliths, the marginal zones of which were opaque from Dec. to May and translucent from June to Nov. Average lengths of the age groups and annual increments were measured from a curve fitted by inspection to point estimates of lengths at capture. Burbot grew 5.7 in during the first yr of life and 4.3 in during the second. Later annual increments through the 12th yr ranged from 1.2 to 2.6 in. Average total lengths and calculated weights were 16.1 in and 1.1 lb at age V and 23.4 in and 3.2 lb at age X. First maturity was at age I, at a total length of 9.7 in for males and 10.7 in for females; all fish were mature at age V and at lengths greater than 16.4 in (males) and 15.9 in (females). Most burbot collected near shore in the Apostle Islands area in late Jan. and Feb. were spent, but none collected in offshore areas during Jan. and March had spawned. The estimated number of eggs in the ovaries of 8 burbot 14.7-21.3 in long ranged from about 268,800 to 1,154,000 and averaged about 812,300. Burbot of all sizes fed on fish and crustaceans. Fish heavily predominated in the food of large burbot taken during the winter (99.6% of the volume) but crustaceans (Mysis and Pontoporeia) became increasingly important during the summer and fall (when they contributed more than 73% of the volume). Due to the wide variety and large volume of food consumed, the burbot is probably a significant competitor of many other species.--Copyright 1973, Biological Abstracts, Inc.
W73-12934

MULTIPLE-USE PROBLEMS IN THE GREAT LAKES.
For primary bibliographic entry see Field 06B.
W73-12960

TOWARD A REGIONAL POLICY FOR THE GREAT LAKES,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 06B.
W73-12963

THE PLANNING VIEWPOINT,
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 06B.
W73-12964

THE SEASONAL ABUNDANCE OF THE ANCYROCEPHALINAE (MONOGENEA) ON LARGEMOUTH BASS IN WALTER F. GEORGE RESERVOIR,
Georgia Univ., Athens. School of Forest Resources.
M. V. Rawson, and Wilmer A. Rogers.
Proc Helminthol Soc Wash. Vol 39, No 2, p 159-162. 1972. Illus.
Identifiers: Abundance, Actinocleidus-Fusiformis, Ancyrocephalinae, Bass, Clavunculus-Bursatus, *Largemouth bass, *Monogenea, Reservoirs, Seasonal, Temperature, Urocleidus-Furcatus, Urocleidus-Principalis.

Four species of Ancyrocephalinae were collected from largemouth bass in Walter F. George Reservoir from Dec. 1967 to Jan. 1969. The abundance of Urocleidus principalis and U. furcatus peaked at 28 C in June and mid-Sept., declined in the early fall, and then rose to another peak in Dec. at 9 C. The abundance of Actinocleidus fusiformis peaked prior to the spring period of maximum temperature change in June and mid-Sept. at 28 C and in Dec. at 9 C. Abundance of Clavunculus bursatus peaked in the early spring and late fall at 9 C. The peaks of abundance seemed to be a water temperature-associated phenomenon.--Copyright 1973, Biological Abstracts, Inc.
W73-12978

2I. Water in Plants

RESISTANCE IN DIGITARIA TO YELLOW SUGARCANE APHID, SIPHAFLAVA (FORBES) AS RELATED TO TEMPERATURE AND RAINFALL,
Agricultural Research Service, Beltsville, Md. Plant Science Research Div.
A. J. Oakes, and A. Sierra-Bracero.
J Agric Univ P R. Vol 56, No 1, p 33-38. 1972.
Identifiers: *Aphids (Yellow sugarcane), *Digitaria, *Rainfall, Sipha-Flava, *Temperature, Differential resistance, Insects.

Differential resistance to yellow sugarcane aphid, Siph flava, exists among Digitaria species. Differential resistance among species is expected on the basis of interspecific variation. Differential resistance to aphid damage exists among clones within species. Differences in insect resistance among clones within species are expected on the basis of intraspecific variation. Clones superior to insect resistance were delineated in this trial. The superior performance of phenotypes within species is masked by the average performance of the species. Significant negative correlations were found between insect resistance ratings and the number of rainy days and average temperature during a 28 day interval prior to rating. A model was calculated for the average behavior of species; it included infestation expected on the basis of the number of rainy days and average temperature during the 28-day interval before rating. The model accounted for approximately 66% of the variability present.--Copyright 1973, Biological Abstracts, Inc.
W73-12643

GREEN SNOW AND ICE FROM THE ANTARCTICA,
National Museum of Natural History, Budapest (Hungary).
E. Kol.
Ann Hist Natl Hung. 63: p 51-56. 1971. Illus.
Identifiers: *Algae, *Antarctica, Bracteococcus-Minor-Var-Glacialis, Chlamydomonas-Ballenyana-Var-Minor, Ice, Seston, *Snow.

Six green algal species, deriving from green snow and ice samples collected by Professor P. M. Arnaud on Terre Adelie, Antarctica, are discussed; the predominating taxa are Bracteococcus minor var. glacialis Flint, and Chlamydomonas ballenyana var. minor var. nova. An alga diagram shows also the quantitive occurrence of the microorganisms of the cryoseston. A review and comparison of the green cryosestons published from the Antarctica are also given.--Copyright 1973, Biological Abstracts, Inc.
W73-12644

WATER PATHWAYS IN HIGHER PLANTS: II. WATER PATHWAYS IN ROOTS,
Southampton Univ. (England). Dept. of Botany.
T. W. Tanton, and S. H. Crowdy.
J Exp Bot. Vol 23, No 76, p 600-618. 1972. Illus.
Identifiers: *Carrots, Plants, *Roots, *Wheat.

The technique for studying the pathways of water movement was applied to the transpiration stream in the roots of higher plants. Free space was confined to the cell walls except in flooded tissue where intercellular spaces were also included. Errors involved in free-space estimates were discussed and free-space volumes of 5.4% were obtained for wheat root cortex and 4.1% for carrot xylem parenchyma. The main water-absorbing regions of roots begin immediately behind the elongating zone, where the first xylem elements are fully differentiated, and end when the endodermis undergoes secondary wall development. In the cortex the transpiration stream is located mainly in the cell wall. Calculations indicate that the symplastic pathway is of only minor importance in transpiring plants. At the endodermis the free-space pathway is blocked by the Casparian strip and all water and solute entering the stele must pass through the lumen of the endodermal cells. The permeability of individual endodermal cells varies considerably both between cells of the same species and between those of different species. Once inside the endodermis, the transpiration stream returns to the cell-wall pathway until it reaches the xylem vessels where it enters the lumen of the mature xylem elements. (See also W73-12652)--Copyright 1973, Biological Abstracts, Inc.
W73-12651

WATER PATHWAYS IN HIGHER PLANTS: III. THE TRANSPIRATION STREAM WITHIN LEAVES,
Southampton Univ. (England). Dept. of Botany.
T. W. Tanton, and S. H. Crowdy.
J Exp Bot. Vol 23, No 76, p 619-625. 1972. Illus.
Identifiers: Bean, *Chelates, Laurel, Lead, *Leaves, Plantain, Plants, Stream, *Transpiration, Wheat.

Water in the transpiration stream is distributed throughout the leaves in the vascular bundles. In wheat, water appears to be confined to the main veins by the mestome sheath and to enter the mesophyll through the walls of the smaller veins. Within the mesophyll the water in the transpiration stream moves in the free space of the cell walls to the evaporating surfaces of the leaf. The lead chelate, which is used to trace the transpiration stream, accumulates at the final points of evaporation at the margin of the leaf. Lead chelate accumulates beneath and on the surface of the cuticle, being partly associated with the anticlinal walls of the epidermal cells, the walls of the stomatal guard cells and specialized epidermal cells. Chelate does not accumulate at the base of substomatal cavities, indicating that the cuticle of the epidermis is the main evaporating surface of the leaf. The behavior in broad bean, laurel, and plantain is essentially the same. The rate of peristomatal and cuticular transpiration is closely related to the size of the stomatal aperture. Conditions which control stomatal aperture also cause changes in the dimensions of the epidermal cells. (See also W73-12651)--Copyright 1973, Biological Abstracts, Inc.
W73-12652

BOTANY ALONG SONAMARG TO TRUNKHAL,
Sri Pratap Coll., Srinagar (India). Dept. of Botany.
K. A. Malik, and G. Singh.
Kashmir Sci. Vol 7, No 1/2, p 82-88. 1970. Illus.
Identifiers: *Botany, Climates, *India, Kashmir, Soils, Sonamarg, Species, Trunkhal, Vegetation.

The botanical tour undertaken in June, 1969 in N. E. Kashmir from Sonamarg to Trunkhal is described. The tract covered is 96 km long, wholly mountainous and surrounded by mountain ranges of considerable heights with snow-covered peaks. A complete physical description of this site is given as to snow cover, rainfall, soil types, and the location of alpine meadows and bodies of water. The distribution of vegetation is given as well as an enumeration of the plant species found.--Copyright 1973, Biological Abstracts, Inc.
W73-12657

WATERFOWL UTILIZATION OF BEAVER PONDS IN NEW BRUNSWICK,
New Brunswick Univ., Fredericton. Northeastern Wildlife Station.
R. N. Renouf.

J Wildl Manage. Vol 36, No 3, p 740-744. 1972. Illus.
Identifiers: Anas-Carolinensis, Anas-Platyrhynchos, Anas-Rubripes, Aytha-Collaris, Bucephala-Clangula, *Canada (New Brunswick), Castor-Canadensis, Lophodytes-Cucullatus, Ponds, *Waterfowl.

Waterfowl utilization of 41 beaver ponds in south-central New Brunswick was studied during 1969. Ponds occupied by beaver (Castor canadensis), temporarily or during the entire field season, were defined as active. There were 15 active and 26 inactive ponds. Black ducks (Anas rubripes) comprised 27 of the 47 broods observed. In addition, green-winged teal (A. carolinensis), hooded merganser (Lophodytes cucullatus) ring-necked duck (Aythya collaris), common goldeneye (Bucephala clangula), and mallard (Anas platyrhunchos) broods were seen. Thirty-eight broods were sighted on active ponds and only 9 on inactive ponds. Active ponds contained 0.75 brood/acre and inactive ponds 0.11 brood/acre. The seasonal drop of the water level was less in active ponds than in inactive ponds. Hence, brood cover was more abundant in active ponds, and the active ponds were better brood-rearing areas.--Copyright 1973, Biological Abstracts, Inc.
W73-12662

WATER TEMPERATURE AND THE MIGRATIONS OF AMERICAN SHAD,
McGill Univ., Montreal (Quebec). Dept. of Biology.
W. C. Leggett, and R. R. Whitney.
U S Natl Mar Fish Ser Fish Bull. Vol 70, No 3, p 659-670. 1972.
Identifiers: Alosa-Sapidissima, *Shad (American), *Water temperature, *Fish migration.

The peak of spawning runs of American shad (Alosa sapidissima) into rivers at various latitudes on the Atlantic and Pacific coasts of North America takes place when water temperatures are near 18.5C. At the Bonneville Dam, Columbia River, Washington, 90% of the run as a rule takes place when river temperatures are between 16.0 and 19.5C. At the fish ladder of the Holyoke Water Power Company on the Connecticut River, the temperature at the peak of the shad run averaged 19.5C for 15 yr. In the St. Johns River, Florida, peak movement occurs in Dec. and Jan. at the time of the annual minimum water temperature, or 14 to 20C. Migrations of shad in the Atlantic Ocean follow paths associated with approximately the same range of temperatures (13-18C). Annual cycles of ocean warming cause shad to move into the Gulf of Maine in the summer, to the middle Atlantic in the winter, and to the south in the early spring. Juvenile shad move downstream in the fall, coinciding with a decline in the temperature of each stream to below 15.5C. A path of migration for shad in the Pacific Ocean is hypothesized from the known seasonal changes in ocean temperature. The potential effects of artificial warming of streams on timing and survival of shad runs in northern and southern latitudes are discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-12666

THE BENTHIC FAUNA IN FOUR SMALL SOUTHERN APPALACHIAN STREAMS,
Georgia Univ., Athens. Dept. of Entomology.
W. R. Woodall, Jr., and J. B. Wallace.
Am Midland Nat, Vol 88, No 2, p 393-407, 1972.
Identifiers: *Appalachia, *Benthic fauna, Biomass, Fauna, Pine, Streams, Vegetation, Watersheds (Basins), *Forest watersheds, Detritus.

Monthly quantitative samples of benthic organisms were collected from streams in 4 different watersheds from Aug. 1968 through July 1969. Each of the watersheds supports one of the following types of vegetation: old-field succession, hardwood forest, white pine forest with a few hardwoods, coppice forest. The kinds of organisms in the 4 streams were generally similar but their relative importance varied significantly. A Duncan's multiple-range test showed significant differences in the numbers of most taxa among the watersheds. The old-field stream had the greatest abundance while the coppice stream had the greatest standing crop biomass. The white pine stream had lowest standing crops of both numbers and biomass. Most of the differences among watersheds were attributed to different inputs of allochthonous detritus.--Copyright 1973, Biological Abstracts, Inc.
W73-12784

EXTREME WATER STRESS AND PHOTOSYNTHETIC ACTIVITY OF THE DESERT PLANT ARTEMISIA HERBA-ALBA ASSO,
Wuerzburg Univ. (West Germany). Botanisches Institut II.
L. Kappen, O. L. Lange, E-D. Schulze, M. Evenari, and U. Buschbom.
Oecologia (Berlin), Vol 10, No 2, p 177-182, 1972. 2 fig, 20 ref.

Descriptors: *Sagebrush, *Soil-water-plant relationships, *Moisture stress, *Hydrostatic pressure, Deserts, Osmotic pressure, Diurnal, Dry seasons, Desert plants, Plant physiology, Leaves, Plant growth, Arid climates, *Photosynthesis, Water requirements, Summer, Metabolixm.
Identifiers: *Israel (Negev Desert), Artemisia herba-alba.

Artemisia herba-alba, a good example of a desert plant growing under high water stress, in the dry season in the Negev Desert, Israel, has a very low water content and shows values of negative hydrostatic pressure in the xylem down to -163 bars and an extreme of osmotic potential in the leaves of -92 bars. During the night the diurnal water stress is not greatly decreased. This study of native plants growing in their natural habitat shows that an extremely low water potential is not a transient phenomenon but a necessity for summer-active desert plants in order to keep up their water supply and metabolic activity during the whole dry season. Thus, a high stress resistance does not imply physiological inactivity, and under these conditions Artemisia is still photosynthetically active for a few hours of the day during the whole dry period. (Gloyd-Arizona)
W73-12785

DELAYED SEED DISPERSAL AND RAPID GERMINATION AS SURVIVAL MECHANISMS OF THE DESERT PLANT BLEPHARIS PERSICA (BURM.) KUNTZE,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
Y. Gutterman.
Oecologia, (Berlin), Vol 10, No 2, p 145-149, 1972. 1 tab, 1 fig, 7 ref.

Descriptors: *Seeds, *Dispersion, *Germination, *Soil moisture, Root development, Desert plants, *Rainfall, Adaptation, Environmental effects, Deserts, Plant growth, Diurnal, Temperature, Geotropism, Laboratory tests, On-site data collections.
Identifiers: Seed dispersal, 'Water clocks', 'Rain clocks', Israel.

Previous studies describe the intricate dispersal mechanism for seeds of the desert plant, Blepharis persica, so that no seeds are dispersed before the soil is wet enough to support the seedlings. Habitat conditions as a part of the survival mechanism are discussed. Laboratory experiments with seeds of six ecotypes of this desert species showed that these seeds are capable of germinating within 50 minutes of exposure to moisture, in light or dark, at temperatures ranging from less than 10C to over 40C. Within the first 24 hours from wetting, moreover, radicles reach a length of about 49 mm. Under natural conditions in sunlight seeds of the six ecotypes sown on the surface of wet sand were examined 50 minutes from the first wetting, and these showed radicles emerging from all seeds and starting to bend geotropically. The rapid germination capability in light and dark over a wide temperature range, together with the two 'water clocks' described earlier, assures that the seeds of this plant are not dispersed and do not germinate until a water supply ample for survival of the seedlings is present. Thus, the germination mechanism of Blepharis is demonstrated to be well adapted to desert conditions and an integral part of the survival mechanism for the species. (Gloyd-Arizona)
W73-12787

CENCHRUS CILIARIS--A PERENNIAL PASTURE GRASS OF ARID AND SEMI-ARID AREAS,
Haryana Agricultural Univ., Hissar (India).
For primary bibliographic entry see Field 04A.
W73-12790

THE INTERRELATIONSHIPS OF THE VEGETATION CHARACTERS OF FOUR SALT DESERT SHRUB ASSOCIATIONS OF COLORADO PLATEAU,
Pakistan Forest Inst., Peshawar.
For primary bibliographic entry see Field 03B.
W73-12791

SODIUM RELATIONS IN DESERT PLANTS: 1. CATION CONTENTS OF SOME PLANT SPECIES FROM THE MOJAVE AND GREAT BASIN DESERTS,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
A. Wallace, E. M. Romney, and V. Q. Hale.
Soil Science, Vol 115, No 4, p 284-287, April 1973. 5 tab, 12 ref.

Descriptors: *Salt tolerance, *Sodium, *Cations, *Plant physiology, *Halophytes, Desert plants, Southwest U.S., Deserts, North America, Saline soils, Habitats, Calcium, Analytical techniques, Salts, Leaves, Soil horizons, Potassium, Soil chemical properties.
Identifiers: Mojave Desert, Great Basin Desert.

The deserts of western North America, and elsewhere, have many plant species that are highly adapted to salinity, and the present study was made in order to obtain a better understanding of salt tolerance in plants. Accordingly, the cation composition of some plant species, native to the northern Mojave and southern Great Basin Deserts and distributed in saline and nonsaline habitats, was examined. Leaves of 23 plant species was analyzed for mineral cations by an emission spectrographic technique. Some species tended to accumulate sodium in the leaves, particularly species that grew in areas where salts had accumulated. Distribution in the field of three Lycium species may be related to salinity. Sodium contents of the Lycium species were inversely related to those of calcium. In areas where other species accumulated sodium, Grayia spinosa was found to be an accumulator of large amounts of potassium. Several members of the Chenopodiaceae accumulated sodium in the leaves but not all of them did. Plant species and soil both seemed to determine the cation contents of plants. Larrea divaricata failed to grow where C horizons were highly saline and where A horizons contained over 10 me/100 g exchangeable potassium. Soil analyses were made for several locations by standard procedures. (See also W73-12793) (Gloyd-Arizona)
W73-12792

SODIUM RELATIONS IN DESERT PLANTS: 2. DISTRIBUTION OF CATIONS IN PLANT PARTS OF THREE DIFFERENT SPECIES OF ATRIPLEX,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
A. Wallace, R. T. Mueller, and E. M. Romney.
Soil Science, Vol 115, No 5, p 390-394, May 1973. 4 tab, 21 ref.

Descriptors: *Salt tolerance, *Sodium, *Cations, *Plant physiology, Desert plants, Southwest U.S., Halophytes, Chlorine, Potassium, Leaves, Root zone, Sodium chloride, Nutrients.
Identifiers: *Saltbush.

Since various mechanisms seem to be involved in desert plants extremely tolerant of high concentrations of salts, sodium distribution in three species of Atriplex of southwestern U.S. was studied. A. hymenelytra cuttings were grown in Yolo loam soil for 35 days after addition of three levels of sodium chloride. Highest concentrations of sodium, chlorine, and potassium occurred in shoots with a steep gradient from top leaves to roots. High concentrations of sodium in leaves indicate the possible presence of salt glands. Yields of A. hymenelytra grown in solution culture responded some to sodium; root to leaf gradients for sodium and potassium were similar to the plants grown in soil. When other nutrients were not limiting, growth of A. confertifolia in the presence of a relatively sharp gradient of sodium content existed with leaves higher than stems and stems higher than roots. Yields were also increased by sodium for A. canescens, but sodium and potassium contents were much lower than for A. confertifolia, and the leaf-stem-root gradient for sodium was poorly pronounced. A. canescens seemed to be resistant to absorption of large quantities of sodium even though it tolerates high levels of it. (See also W73-12792) (Gloyd-Arizona)
W73-12793

WELWITSCHIA MIRABILIS: PARADOX OF THE NAMIB DESERT,
C. H. Bornman.
Endeavour, Vol 31, No 113, p 95-99, May 1972. 8 fig, 5 ref.

Descriptors: *Leaves, *Desert plants, *Moisture uptake, *Plant tissues, Gymnosperms, Africa, Fog, Plant morphology, Water utilization, Stomata, Absorption, Solutes, Translocation, *Adaptation, Arid climates, Deserts, Plant growth, Plant physiology, Root systems, Hydrostatic pressure, Evolution.
Identifiers: *Namib Desert (South West Africa), Coastal deserts, *Welwitschia.

Welwitschia mirabilis, first described in 1861, is a long-lived perennial, endemic to the Namib Desert of South West Africa. It is a monotypic species, grouped with the genera Ephedra and Gnetum in the Order Gnetales, Class Gymnospermae. Non-xeromorphic in aspect, the plant consists of a woody, unbranched, turnip-shaped stem having a depression surrounded by a rim of green, meristematic tissue from which two giant, parallel-ribbed leaves arise. The leaves, very long-lived and persistent, may reach enormous proportions and seem remarkably adapted to the prevailing desert conditions and coastal fog. It is on these huge exposed leaf surfaces that the early-morning fog condenses, is absorbed through the stomata, and conducted to various parts of the plant. The root system is relatively shallow and simple. Anatomical investigations by the author and others indicate that the ultrastructure of the food-conducting tissue of Welwitschia provides significant evidence against the theory of mass-flow of dissolved organic substances by hydrostatic pressure -- research that well may affect quite profoundly current concepts of food transport in plant tissues. This plant probably orginiated under tropical conditions, evolving and adapting in its development to the changing climatic conditions, now manifest by those of the Namib with its coastal fog. (Gloyd-Arizona)
W73-12796

MUSSELS IN THE UNIQUE NICKAJACK DAM CONSTRUCTION SITE, TENNESSEE RIVER, 1965,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Environmental Research and Development.
B. G. Isom.
Malacol Rev. Vol 5, No 1, p 4-6. 1972. Illus.
Identifiers: *Construction sites (Dams), Corbicula-Manilensis, Dams, *Mussels, Nickajack Dam, Rivers, *Tennessee River, Clams.

Nickajack Dam is located at Tennessee River Mile (TRM) 424.7 in Marion County, Tennessee, just northwest of the juncture of the state lines of Alabama, Georgia and Tennessee. Mussels were collected 16 June 1965, the day the coffer dam was dewatered and the riverbed exposed for construction of the dam. Seventeen species of mussels and the Asiatic clam (Corbicula manilensis) were collected from the site. Seventy-six percent (13 of 17) of the mussel species collected were those reported by Ortmann (1925).--Copyright 1973, Biological Abstracts, Inc.
W73-12800

THE ANNUAL CYCLE OF SMALL MAMMAL POPULATIONS ON A ZAMBIAN FLOODPLAIN,
Akron Univ., Ohio. Dept. of Biology.
W. Sheppe.
J Mammal. Vol 53, No 3, p 445-460. 1972, Illus.
Identifiers: *Annual cycle, Crocidura-mariquensis, Crocidura-occidentalis, Floodplains, *Mammals, Mastomys-natalensis, Pelomys-fallax, *Zambian floodplain, Animal populations.

Several species of rodents and shrews live on the Kafue River Flats when they are not covered by floodwaters. Mastomys natalensis is usually the most abundant. Pelomys fallax, Crocidura mariquensis, and C. occidentalis often are common in wet sites. Breeding begins late in the dry season and is at its height during the rains. Populations are built up at this time, and as floodwaters rise over a period of several months they are forced to the margins of the floodplain, where they sometimes form dense refugee populations. As the flood slowly recedes they follow it out, and by the end of the dry season the few surviving animals are confined largely to marshy areas near the river. Body weight and fat deposits decrease during the dry season. Live-trapping studies suggest that populations are unstable throughout the year, with few animals resident in an area for more than a few weeks. Small mammals adapt to the unstable environment of the Flats by moving about more than populations in more stable environments and by breeding rapidly when conditions permit.--Copyright 1973, Biolgical Abstracts, Inc.
W73-12814

FROST RESISTANCE IN EUCALYPTUS: A NEW METHOD FOR ASSESSMENT OF FROST INJURY IN ALTITUDINAL PROVENANCES OF E. VIMINALIS,
Australian National Univ., Canberra. School of General Studies.
D. M. Paton.
Aust J Bot. Vol 20, No 2, p 127-139. 1972, Illus.
Identifiers: Altitudinal cline, Assessment, *Eucalyptus, Eucalyptus-viminalis, *Frost injury (Plants), Methods, Plant growth, *Australia.

Seedlings of E. viminalis were grown under controlled environmental conditions and exposed to single frost treatments between -1 and -5C. A new objective method for assessment of frost injury was developed on the basis that killed leaf tissue lost water until equilibrium was established with atmospheric moisture. The percentage ratio of dry weight to wet weight was found to increase from 30% for unaffected plants to 85% for killed plants, and intermediate values provided a reliable quantitative assessment of the severity of intermediate injury. There was no clear relationship between frost resistance and growth rate. Frost resistance increased with increase in altitude of seed source about 1000 ft, but the sea level provenance was as frost-resistant as the provenance at 3600 ft, which suggested that more than an altitudinal cline for frost resistance is involved. Variation in frost resistance with'n half-sib families and within provenances was often significant and of the same order as the variation between provenances. Thus frost resistance in E. viminalis appears to involve several different mechanisms. Within-provenance and within-family variability was characterized by a low frequency of plants with intermediate injury, and the implications of balancing selection between susceptible and resistant phenotypes as one possible mechanism for this, are discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-12815

FISHES OF THE YELLOW MEDICINE RIVER IN SOUTHWESTERN MINNESOTA,
Southwest Minnesota State Coll., Marshall. Dept. of Biology.
C. H. Ernst.
J Minn Acad Sci. Vol 38, No 1, p 14-16, 1972, Illus.
Identifiers: *Fishes, Impoundments, *Minnesota, Rivers, *Yellow Medicine River (Minn).

In view of the possible impoundment of the Yellow Medicine River in southwestern Minnesota, by a proposed Army Corps of Engineers dam, a survey of the fish-fauna of this river was undertaken. The fish-fauna is listed and discussed, as are the possible effects of the impoundment.--Copyright 1973, Biological Abstracts, Inc.
W73-12821

THE PROFUNDAL FAUNA OF LLYN TEGID, NORTH WALES,
Liverpool Univ. (England). Dept. of Zoology.
P. C. Hunt, and J. W. Jones.
J Zool Proc Zool Soc Lond. Vol 168, No 1, p 9-49, 1972, Illus.
Identifiers: Distribution patterns, Fauna, Invertebrates, *Profundal fauna, Seasonal, *Wales (Llyn Tegid).

Benthic fauna samples were quantitatively collected each month from the 6-40 m depth zone of Llyn Tegid (Great Britain) for a period of 1 yr. The seasonal distribution, abundance and life cycles of the invertebrate species are discussed in addition to a general description of the physical and chemical environment in which they live. The abundance and composition of the profundal fauna is compared with that of a similar survey carried out by D. R. Dunn in 1951/2 and shows a fourfold increase in total numbers of animals. The contributions to the increased profundal fauna of all animals recorded in 1951/2 and of those that have colonized this zone since that time are discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-12823

NUTRIENT UPTAKE BY TUPELO GUM AND BALD CYPRESS FROM SATURATED OR UNSATURATED SOIL,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
R. E. Dickson, T. C. Broyer, and C. M. Johnson.
Plant Soil. Vol 37, No 2, p 297-308, 1972.
Identifiers: Anaerobic conditions, *Bald cypress, Environment, *Nutrient, Nyssa-aquatica, Saturated soil, Taxodium-distichum, *Tupelo gum.

Seedlings of tupelo gum (Nyssa aquatica L.) and bald cypress (Taxodium distichum L. Rich.) were

grown in pots containing a sphagnum moss-peat soil mix. Plants approximately 20-25 cm tall were subjected to 3 moisture treatments, saturated-aerated, saturated, and unsaturated soil; and 3 N fertilization treatments, control (no N added), urea (a reduced N source) and nitrate (an oxidized N source). Data include dry weights (g/culture) of leaves, stems, and roots; concentrations (percentage of dry weight) and contents (mg/culture) of N, P, K, Ca and Mg in leaves, stems and roots. Total dry weight was greater for plants grown in saturated-aerated soil than in either saturated or unsaturated soil. Differences in nutrient absorption and distribution between the plants and among the water treatments were principally the result of growth differences produced by the water treatments. Element contents and often the concentrations of P, K, Ca or Mg were highest in both species when grown on saturated-aerated soil and lowest when grown on unsaturated soil. The low levels of N in plants grown on saturated soils were probably the result of dentrification, as shown by the greater content of N in plants grown on soil fertilized with urea as opposed to nitrate. Thus, urea would appear to be a better N source than nitrate for fertilization in swamp forests. Growth of, and nutrient uptake by cypress was restricted less than that of Tupelo when the plants were grown on saturated as compared to saturated-aerated soil. Thus, cypress appeared more tolerant than tupelo to the anaerobic root environment found in saturated soil.--Copyright 1973, Biological Abstracts, Inc.
W73-12828

WATER POTENTIAL IN RED PINE: SOIL MOISTURE, EVAPOTRANSPIRATION, CROWN POSITION,
Minnesota Univ., St. Paul. Coll. of Forestry.
E. Sucoff.
Ecology. Vol 53, No 4, p 681-686. 1972. Illus.
Identifiers: Diurnal, *Evapotranspiration, Growth, Patterns, *Pines (Red), Pinus-Resinosa, Soils, Transpiration, *Soil moisture.

Diurnal patterns in leaf water potential (LWP) were examined on 8 red pine (Pinus resinosa Ait) trees throughout 1 summer in northern Minnesota. The daily high in LWP was plotted against total soil moisture to produce a soil-moisture release curve characterizing the plant-soil-atmosphere system. Diurnal patterns in LWP at various soil moistures were compared. Also compared were patterns in LWP under high and low evaporational demand and constant soil moisture. Results were generally consistent with previously constructed models. Very little variation in LWP was observed among whorls or needle ages. Laboratory studies of the effects of LWP when synthesized with data from the forest on occurrence of LWP suggest that growth was limited by water deficit every day of the 1969 summer.--Copyright 1973, Biological Abstracts, Inc.
W73-12837

WATER RELATIONS OF PLANTS IN RAISED SPHAGNUM PEAT BOGS,
Department of Agriculture, Ottawa (Ontario). Plant Research Inst.
E. Small.
Ecology. Vol 53, No 4, p 726-728. 1972. Illus.
Identifiers: Bogs, Drought, *Peat bogs, Physiological studies, Sphagnum, Woody plants.

The water relations of woody plants of a raised sphagnum peat bog were examined by evaluation of water potential employing the pressure bomb and by measuring transpiration resistance with a leaf-resistance porometer. The plants studied proved to be similar to those of a number of mesophytes growing adjacent to the bog and exhibited no evidence of drought stress. The concept of physiological drought is an inadequate explanation of the extremely xeromorphic characteristics of bog vegetation, which are more plausibly accounted for by other factors.--Copyright 1973, Biological Abstracts, Inc.
W73-12838

THE INFLUENCE OF ORGANIC DRIFT ON THE FOOD HABITS AND LIFE HISTORY OF THE YELLOWFIN SHINER, NOTROPIS LUTIPINNIS (JORDAN AND BRAYTON),
Oklahoma Univ., Norman. Dept. of Zoology.
W. K. Reisen.
Am Midland Nat. Vol 88, No 2, p 376-383. 1972.
Identifiers: *Drift (Organic), Food habits, Invertebrates, Life history, Notropis-Luptipinnis, Organic, *Shiners (Yellowfin), *South Carolina (Praters Creek).

Recent investigations of invertebrate drift have suggested a food chain relationship between riffle-dwelling benthos and lotic fishes, with drift acting as a transport mechanism facilitating predation. A year-long study of N. lutipinnis (Jordan and Brayton), in Praters Creek, Pickens Co., South Carolina, has shown that significant synchronization exists among drift, fish-feeding activity and spawning. A qualitative and quantitative evaluation of adult stomach contents suggested that the drifting invertebrates were consumed in quantities proportional to their composition by weight in the drift. Cyprinidae fry drifted during May when the total invertebrate drift was highest. Drifting fry exhibited a marked nocturnal periodicity with the greatest numbers recovered between 0330 and 0530 AM.--Copyright 1973, Biological Abstracts, Inc.
W73-12844

PHYSIOLOGY AND CYTOLOGICAL CHEMISTRY OF BLUE-GREEN ALGAE,
MSU/AEC Plant Research Lab., East Lansing, Mich.
For primary bibliographic entry see Field 05C.
W73-12845

EXTENSION OF RANGE OF THE TRICLAD TURBELLARIAN PHAGOCATA GRACILIS (HALDEMAN),
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. C. Smrchek.
Trans Am Microsc Soc. Vol 91, No 4, p 596-599. 1972. Illus.
Identifiers: Dugesia-dorotocephala, Dugesia-tigrina, *Michigan, Phagocata-gracilis, Phagocata-morgani, Phagocata-velata, Procotyla-fluviatilis, *Triclad turbellarian.

The triclad P. gracilis (Haldeman, 1840) is reported for the first time from Michigan. Numerous individuals were first collected in 1968 in Oden Stream (T35N R4W S18), Emmet County, a cold, spring-fed fish hatchery outlet stream. Ecological data collected over a 2 mo. period and observations on planarian populations are presented. Other species found in the stream include Dugesia dorotocephala, D. tigrina, Phagocata morgani, P. velata, and Procotyla fluviatilis; Dugesia dorotocephala may be unable to compete with Phagocata gracilis.--Copyright 1973, Biological Abstracts, Inc.
W73-12856

THE ASSOCIATION OF AMPHIPODS IN THE SHALLOW-WATER SAND HABITAT OF STRANGFORD LOUGH, CO. DOWN,
Queen's Univ., Belfast (Northern Ireland). Dept. of Zoology.
For primary bibliographic entry see Field 05A.
W73-12879

MICRODISTRIBUTION AND DENSITY AS FACTORS AFFECTING THE DOWNSTREAM DRIFT OF MAYFLIES,
Saskatchewan Univ., Saskatoon. Dept. of Biology.
D. M. Lehmkuhl, and N. H. Anderson.
Ecology. Vol 53, No 4, p 661-667. 1972. Illus.
Identifiers: Behavior, Density, Distribution patterns, *Drift, *Mayflies.

During high volume of flow in a stream that has considerable seasonal fluctuation, the microdistribution of 5 species of mayflies was determined by displacement of individuals by drift from rapid current areas to those with gentle or no current. The major effect of drift was dispersal, not depletion, of the mayfly population. Occurrence in drift is determined by a species-specific complex of interdependent factors including life cycle, microdistribution (both before and after the effect of spates), and the behavioral characteristic of individual species.--Copyright 1973, Biological Abstracts, Inc.
W73-12888

DESCRIPTION AND ECOLOGY OF HYAIELLA TEXANA N. SP. (CRUSTACEA: AMPHIPODA) FROM THE EDWARDS PLATEAU OF TEXAS,
Oklahoma Univ., Norman. Dept. of Zoology.
M. M. Stevenson, and A. E. Peden.
The American Midland Naturalist, Vol 89, No 2, p 426-436, April 1973. 7 fig, 6 ref.

Descriptors: *Amphipoda, *Crustaceans, *Ecology, *Systematics, *Speciation, *Texas, Aquatic habitats, Invertebrates, Aquatic animals, Classification, Animal populations, Water temperature.
Identifiers: *Hyalella texana, Hyallela azteca, *Clear Creek (Tex), Arthropods, Animal morphology, Population density, Macroinvertebrates, Scuds.

Hyalella texana, a new species of amphipod crustacean, is described from Clear Creek Spring, Menard County, Texas, 16.7 km W of Menard. It is distinguished from H. azteca, which also occurs at this locality, by the presence of four large tergite spines, enlarged mouth parts, more antennal segments and narrower body and appendage segments. Each species is found predominantly in different habitats of the spring area. (Holoman-Battelle)
W73-12900

SOME MARINE DIATOMS FROM THE GALAPAGOS ISLANDS,
N. I. Hendey.
Nova Hedwigia, Vol 22, Nos. 1-2, p 371-422, 1971. 32 fig, 68 fig.

Descriptors: *Diatoms, *Marine algae, *Speciation, *Classification, Chrysophyta, Varieties, Systematics, Plant groupings, South America, Marine plants.
Identifiers: *Galapagos Islands.

One hundred and seventy-six specific taxa of marine diatoms have been identified and four previously unknown taxa have been described from material collected by Dr. Ira L. Wiggins from Isla Fernandina, Galapgos Islands, on January 27, 1967. The material was taken from foam washed up by surf at Punta Espinosa. The classification used is according to Hendey (1958, 1964). Descriptions are given only of the lesser known taxa. (Holoman-Battelle)
W73-12902

EFFECTS OF AERATION, WATER SUPPLY, AND NITROGEN SOURCE ON GROWTH AND DEVELOPMENT OF TUPELO GUM AND BALD CYPRESS,
Forest Service (USDA), Rhinelander, Wis. North Central Forest Experiment Station.
R. E. Dickson, and T. C. Broyer.
Ecology. Vol 53, No 4, p 626-634, 1972, Illus.
Identifiers: *Aeration, *Cypress (Bald), Fertilizers, Growth, *Gum (Tupelo), Moisture, *Nitrogen, Nyssa-Aquatica, Soils, Taxodium-Distichum, Water supply.

Seedlings of tupelo gum (Nyssa aquatica L.) and bald cypress (Taxodium distichum L. Rich.) were cultured in saturated-aerated, saturated and unsaturated soil. Experiments were designed to measure and evaluate the relative reaction of tupelo and cypress to various soil-moisture conditions, determine the effects of aeration and water availability on plant moisture stress and growth, and compare effects of 2 forms of N fertilizer (urea and nitrate) on growth. On the basis of height and dry weight, both tupelo and cypress grew best in saturated-aerated soil. Growth was better in saturated soil then in unsaturated soil, but only when water in the unsaturated soil decreases substantially below field capacity before rewatering. Plant moisture stress was determined by a pressure-bomb technique. For tupelo, average daily maximum tensions were 7.2 and 7.0 atm (atm±1.013 bar) with saturated and unsaturated soil, respectively; for cypress, comparative tensions were 10.9 and 8.5 atm. When soil moisture decreased from field capacity to the wilting point, the daily maximum tension in plants increased from 7.0 to 12.8 and from 8.5 to 17.6 atm in tupelo and cypress, respectively. Growth of plants was related to the cumulative effect of their internal moisture stress. When tupelo plants were subjected to 595 atm days (daily maximum tension X number of days with that tension), height growth was 37% and dry weight 40% less than plants subjected to 490 atm-days. Fertilization with urea produced more growth than fertilization with nitrate.--Copyright 1973, Biological Abstracts, Inc.
W73-12923

THE PHYSIOGNOMY AND STRUCTURE OF THE BENTHIC MACROPHYTE COMMUNITIES ON ROCKY SHORES IN THE SOUTHWESTERN ARCHIPELAGO OF FINLAND (SEILI ISLANDS),
Turku Univ. (Finland) Dept. of Botany.
For primary bibliographic entry see Field 05A.
W73-12929

EFFECT OF ENVIRONMENTAL FACTORS ON WATER UTILIZATION AND BORON ACCUMULATION AND TRANSLOCATION IN SUGARCANE,
Hawaii Agricultural Experiment Station, Honolulu.
For primary bibliographic entry see Field 03F.
W73-12966

THE DISTRIBUTION OF STREAM-DWELLING TRICLADS (PLATYHELMINTHES) IN NORTH WALES,
Reading Univ. (England). Dept. of Zoology.
J. F. Wright.
Freshwater Biol. Vol 2, No 1, p 57-64. 1972. Illus.
Identifiers: *Distribution patterns (Fauna), Streams, *Triclads (Plathyhelminthes), *Wales.

Information collected during a survey of stream-dwelling triclads in 2 contrasted areas of North Wales is presented. The first study area was located in Caernarvonshire, Wales on the mainland of North Wales and included a mountainous region rising to over 1000 m with abundant cold springs. In contrast, the study area on the nearby island of Anglesey was characterized by relatively warm, slow-flowing streams passing through gently undulating land which did not rise above 153 m. The object of the survey was to collect background data so that suitable streams could be chosen for more intensive studies on factors determining the distribution and abundance of stream-dwelling triclads. Distribution maps for the commonly occurring species were prepared and observations on the relationship between source-type and triclad fauna were obtained. The possible role of interspecific competition was of particular interest.--Copyright 1973, Biological Abstracts, Inc.
W73-12971

GROWTH AND CHEMICAL COMPOSITION OF EIGHT GRASSES GROWN UNDER HIGH WATER TABLE CONDITIONS,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
D. V. Waddington, and T. L. Zimmerman.
Commun Soil Sci Plant Anal. Vol 3, No 4, p 329-337. 1972.
Identifiers: Agrostis-Palustris, Agrostis-Tenuis, *Chemical composition (Grasses), Clipping, Eleusine-Indica, Festuca-Arundinacea, Festuca-Rubra, *Grasses, Growth, Lolium-Perenne, Poa-Annua, Poa-Pratensis, Rooting, *Water table, Yields.

Eight grasses (Eleusine indica, Poa annua, P. pratensis, Agrostis tenuis, A. palustris, Festuca arundinacea, F. rubra, Lolium perenne) were grown under high water table conditions for 14 wk in a greenhouse experiment. Water tables were maintained at 2 and 5 inches below the soil surface. Differences in water table depth influenced clipping yields only slightly. Although total root weights were not reduced with the 2-inch water table, there was a trend for fewer roots at lower depths and more roots near the surface with this treatment. The shallowest root systems occurred with annual bluegrass, Kentucky bluegrass and creeping red fescue. Elemental composition of the clippings was influenced by species and time of sampling. The greatest effect of water table depth on elemental content of the clippings occurred with Mn.--Copyright 1973, Biological Abstracts, Inc.
W73-12972

EFFECTS OF WATER STRESS ON NITROGEN--FIXING ROOT NODULES: IV. EFFECTS ON WHOLE PLANTS OF VICIA FABA AND GLYCINE MAX,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
For primary bibliographic entry see Field 03F.
W73-12977

THE SELECTION OF EUCALPTS FOR REGENERATION,
Australian National Univ., Canberra. Dept. of Botany.
L. D. Pryor.
Appita. Vol 26, No 1, p 35-38. 1972.
Identifiers: Eucalpts, *Eucalptus, Fire Rainfall, *Regeneration.

Species of winter rainfall areas fall in summer rainfall zones but the reverse is not the case. Species from cooler zones fail in subtropical lowland situations. Species of the Monocalyptus group are usually more difficult to transfer 'off-site' than species in other groups. Species known to be limited in their natural range by fire, if fire protected, can be extended readily into sites adjoining those of their natural occurrence.--Copyright 1973, Biological Abstracts, Inc.
W73-12980

STUDIES ON HELMINTHS OF NORTH DAKOTA: IV. PARASITES OF THE RIVER CARPSUCKER, CARPIODES CARPIO, WITH DESCRIPTIONS OF THREE NEW SPECIES (MONOGENEA),
Minot State Coll, N. Dak. Dept. of Biology.
D. C. Kritsky, P. D. Leiby, and M. E. Shelton.
J Parasitol. Vol 58, No 4, p 723-731. 1972. Illus.
Identifiers: Anonchohaptor-Muelleri, Camallanus-Ancylodirus, Carpiodes-Carpio, *Carpsucker, Gyrodactylus-Dakotensis, *Helminths, Icelanonchohaptor-Microcotyle, Monogenea, Neodiscocotyle-Carpioditis, *North Dakota, Parasites, Pellucidhaptor-Eremitis, Pellucidhaptor-Micracanthus.

Three trematodes (Monogenea:Dactylogyridae), Anonchohaptor muelleri, Icelanochohaptor microcotyle and Pellucidhaptor micracanthus, are described from Carpiodes carpio (Raf.) from the Missouri River in North Dakota and South Dakota. The generic diagnoses of Anonchohaptor Mueller, 1938, and Pellucidhaptor Price and Mizelle, 1964, are emended. The finding of Gyrodactylus dakotensis Leiby et al., 1972, Neodiscocotyle carpioditis Dechtiar, 1967, P. eremitis Rogers, 1957 (monogenetic trematodes), and Camallanus ancylodirus Ward and Magath, 1916 (nematode), from C. carpio constitute new host records. Also, 7 new locality records are established, 6 of which are reported for the first time from the upper Missouri River.--Copyright 1973, Biological Abstracts, Inc.
W73-12984

CONTRIBUTIONS TO THE LIFE HISTORY OF THE PIUTE SCULPIN IN SAGEHEN CREEK, CALIFORNIA,
National Marine Fisheries Service, Miami, Fla. Southeast Fisheries Center.
A. C. Jones.
Calif Fish Game. Vol 58, No 4, p 285-290. 1972.
Identifiers: *California, Cottus-Beldingi, History, Insects, Larvae, *Piute sculpin, Sagehen Creek (Calif), Salmo-Gairneri, Salmo-Trutta, Salvelinus-Fontinalis, Sculpin.

The Piute sculpin, Cottus beldingi Eigenmann and Eigenmann, is the dominant fish by number of weight in Sagehen Creek, a mountain stream on the east slope of the Sierra Nevada. Sculpins are at their greatest density in the middle of the creek where they, along with brook trout (Salvelinus fontinalis) and rainbow trout (Salmo gairdneri), find good foraging for bottom dwelling aquatic insect larvae. The numbers of sculpins are low in the precipitous headwaters of Sagehen Creek and also low in the lower reaches of the stream, which are frequented by their chief predator, the brown trout (Salmo trutta), and by other fishes. Sculpins in Sagehen Creek and Lake Tahoe exhibit minor differences in growth and reproduction but appear to occupy a similar ecological niche in the 2 areas.--Copyright 1973, Biological Abstracts, Inc.
W73-12986

PARASITISM OF MOSQUITOES BY WATER MITES,
Ohio Dept. of Health, Columbus. Div. of Communicable Diseases.
M. Jalil, and R. Mitchell.
J Med Entomol. Vol 9, No 4, p 305-311. 1972. Illus.
Identifiers: Abundance, Morphology, *Mosquitoes, Parasitisms, Pionid, Population, Thyasid, *Ohio, *Water mites.

A large sample of Ohio mosquitoes was parasitized by 2 kinds of water mites. Thyasid-type mites walk on the water surface and encounter hosts there while the pionid-type larvae are strictly aquatic. The 2 types of larvae differ greatly in general morphology. Both kinds of larvae are locally abundant in Ohio but the species and their degree of host specificity remain to be worked out. A few local populations of mosquitoes are so heavily infested that the mites could serve as useful markers in studies of these populations. The discouraging results attempts to use water mites as markers are due to failure to separate records and identify kinds of mite larvae. When records are not pooled and the biology of the mite given due consideration, it is possible to use the parasitic larvae in distribution and age-grading studies of their host mosquitoes.--Copyright 1973, Biological Abstracts, Inc.
W73-12987

CHARACTERIZATION OF EXUDATION FROM EXCISED ROOTS OF ONION, ALLIUM CEPA: I. WATER FLUX,
Liverpool Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 03F.
W73-12989

EFFECT OF TIME, WATER FLOW AND PH ON CENTRIPETAL PASSAGE OF RADIOPHOSPHORUS ACROSS ROOTS OF INTACT PLANTS,
Connecticut Univ., Storrs. Dept. of Plant Science.
For primary bibliographic entry see Field 05B.
W73-12991

2J. Erosion and Sedimentation

THE SEDIMENTS AND HISTORY OF LAKE BUTTE DES MORTS, WISCONSIN,
Wisconsin State Univ., Oshkosh. Limnology Lab.
J. W. McKee, and J. S. Laudon.
Available from the National Technical Information Service as PB-222 273, $3.50 paper copy, $1.45 in microfiche. Report of Investigations Number 3, March 1972. 55 p, 15 fig, 4 ref. OWRR A-019-WIS (1). OWRR A-030-WIS (1). 14-01-0001-1870, 14-31-0001-3050.

Descriptors: *Sediments, *Erosion, Vegetation effects, Interfaces, *Glacial drift, Lakes, *Marsh plants, *Lake sediments, Geologic history, *Wisconsin.
Identifiers: *Lake Butte des Morts (Wis).

Study of the sediments of Lake Butte des Morts, Wisconsin, and their stratigraphic relationships, has produced a history of lake evolution from the early years of the last deglaciation. Samples of bottom sediment (at the sedimentary interface) were taken from locations selected to represent each environment of deposition in the lake. In the laboratory cores were extruded from the plastic corer liners for analysis and the sediments were divided into eleven types. These sediment types are not intended to represent stratigraphic units though some may exist as a unit and may be conceptually categorized as a rock-stratigraphic unit--e.g.--the red varved clay. The paleolimnological approach provides background information of value in the management of lakes and also adds some detail to the knowledge of local natural history. (Kerrigan-Wisconsin)
W73-12355

ASPECTS OF THE BIOGEOCHEMISTRY OF CARBOHYDRATES AND PROTEINS IN AQUATIC ENVIRONMENTS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05C.
W73-12371

STRATIGRAPHY OF FOSSIL PIGMENTS AS A GUIDE TO THE POSTGLACIAL HISTORY OF KIRCHNER MARSH, MINNESOTA,
Ohio Wesleyan Univ., Delaware. Dept. of Botany and Bacteriology.
For primary bibliographic entry see Field 05C.
W73-12386

SEDIMENT-WATER NUTRIENT INTERCHANGE IN EUTROPHIC LAKES,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 05C.
W73-12395

CATASTROPHIC ROCK SLIDE, MOUNT HUASCARAN, NORTH-CENTRAL PERU, MAY 31, 1970,
J. M. Browning.
American Association of Petroleum Geologists Bulletin, Vol 57, No 7, p 1335-1341, July 1973. 8 fig, 5 ref.

Descriptors: *Rockslides, *Landslides, *Debris avalances, *Disasters, Avalanches, South America, Mass wasting, Sediment transport, Sedimentation.
Identifiers: *Peru, *Mt Huascaran.

A catastrophic rockslide involving over 2 million cu m of rock moved down the valley of the Llanganuco River, and split into two lobes, one of which killed approximately 2,000 people in the town of Rangrahirca and the other killed approximately 19,00 people in the town of Yungay. The slide was triggered by an earthquake 85 km away, at a depth of 54 km. In the upper and steepest drop the slide fell and swept as a nearly friction-free unit mass a distance of 14.5 km, a vertical drop of 13,700 ft, in 3 minutes. Over the next 50 km the slide moved as a fluid mass, covering the distance in 2 hours. Deposition from the slide was velocity-dependent. (Knapp-USGS)
W73-12409

CHARACTERISTIC PHYSICAL AND BIOGENIC SEDIMENTARY STRUCTURES IN GEORGIA ESTUARIES,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 02L.
W73-12410

GLACIAL ENVIRONMENT AND PROCESSES IN SOUTHEASTERN ALASKA,
Massachusetts Univ., Amherst. Coastal Research Center.
For primary bibliographic entry see Field 02C.
W73-12423

BUREAU OF RECLAMATION PROCEDURES FOR PREDICTING SEDIMENT YIELD,
Bureau of Reclamation, Denver, Colo.
R. I. Strand.
Paper, Sediment Yield Workshop, USDA Sediment Lab, Oxford, MS, Nov 1972. 15 p, 3 fig, 4 tab, 5 ref.

Descriptors: *Sediment transport, Sediment load, Bed load, *Sedimentation, Analytical techniques, Sedimentation rates, Sediment discharge, Storage capacity, Drainage systems, Runoff, Watersheds (Basins), On-site data collections, Forecasting.
Identifiers: San Juan River, Lake Havasu, Sediment rating curves, Runoff plot, Flow duration curves, Calculations.

The techniques used by the Bureau of Reclamation for predicting sediment yields vary depending on data available and complexity of the problem. For situations involving large reservoirs with large drainage areas and significant sediment inflows, the flow-duration, sediment rating curve procedure is used with corrections for unmeasured load. An example using this procedure is given for the San Juan River and indicates 58% of the annual sediment yield occurs during the thunderstorm period, although the runoff during that period is only 36% of the average annual value. In another situation where Alamo Dam was closed upstream of Lake Havasu, sediment yield rate curves were used to calculate the new sediment yield. These curves are developed by plotting the sediment yield per unit area per year against the drainage area for watersheds with similar climatic, topographic, and geologic conditions. For smaller drainage systems intersected by conveyance systems, predicting sediment yield is more difficult and further study is needed. (USBR)
W73-12479

SEA-LAND NAVIGATION STUDIES; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 08B.
W73-12567

SHOALING CONDITIONS, ST. LOUIS HARBOR, MISSISSIPPI RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 08B.
W73-12570

LEAD POLLUTION: RECORDS IN SOUTHERN CALIFORNIA COASTAL SEDIMENTS,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05B.
W73-12589

RIVER CHANNEL CHANGE WITH TIME: AN EXAMPLE,
Geological Survey, Berkeley, Calif.
L. B. Leopold.
Geological Society of American Bulletin, Vol 84, No 6, p 1845-1860, June 1973. 17 fig, 3 tab, 4 ref.

Descriptors: *Alluvial channels, *Urbanization, *Geomorphology, *Meanders, Erosion, Sedimentation, Runoff, Discharge (Water), Urban hydrology, Channel morphology, Flood plains.
Identifiers: Rockville (Md).

Channel cross sections were surveyed over a period of 20 years (1953 to 1972) to determine the amount and kind of change of channel area and position of a 3.7-sq-mi basin, Watts Branch, near Rockville, Maryland. For the first 12 years, the channel progressively but slowly became smaller as urbanization of the basin gradually proceeded. After 1966, a threshold of change apparently was passed and, probably as a result of an increased rate of land alteration upstream, large amounts of sediment were deposited within the channel and overbank. The number of floods exceeding channel capacity increased from two to more than 10 per year. Simultaneously, the channel area began to increase. Despite the trend toward increasing cross-sectional area, the net result after 20 years was a channel smaller by 20% than it had been originally. Urbanization did not alter the rate of channel migration. (Knapp-USGS)
W73-12590

SEA FLOOR OFF MAGDALENA DELTA AND SANTA MARTA AREA, COLOMBIA,
Scripps Institution of Oceanography, La Jolla, Calif.
F. P. Shepard.
Geological Society of America Bulletin, Vol 84, No 6, p 1955-1972, June 1973. 12 fig, 11 ref. ONR Contract N00014-69-A-0200-6006; NSF Grant GA-4593.

Descriptors: *Bottom sediments, *Submarine canyons, *Deltas, Topography, Sedimentation, Continental shelf, Sounding, Stratigraphy, Sedimentary structures, South America, Structural geology.
Identifiers: Andes, Colombia.

The undersea slope bordering the Magdalena delta and the adjacent Andes has a complex morphology. This includes typical delta-front valleys directly off the Magdalena River and off its old mouths. The area is bordered to the west by anticlinal hills and synclinal valleys, and to the north by fault blocks with a northeasterly trend. To the east, the slope has mud diapirs rising mostly from between 730 and 1,370 m. Off the mountainous coast east of Santa Marta, a large submarine canyon winds down the slope almost to Colombia Basin. The sea-floor relief was formed by a combination of complex faulting and folding, sedimentation from the Magdalena (with attendant formation of slump valleys), partial filling of structural valleys, diapiric intrusion of plastic mud from underlying formations, and marine erosion of a large submarine canyon. (Knapp-USGS)
W73-12591

COMPUTER MODELS OF DELTA GROWTH DUE TO SEDIMENT INPUT FROM RIVERS AND LONGSHORE TRANSPORT,
Oregon State Univ., Corvallis. School of Oceanography.
P. D. Komar.
Geological Society of America Bulletin, Vol 84, No 7, p 2217-2226, July 1973. 9 fig, 2 tab, 16 ref. NOAA Sea Grant 2-35187.

Descriptors: *Deltas, *Sediment transport, *Waves (Water), *Simulation analysis, Mathematical models, Sedimentation, Littoral drift.

Computer-simulation models were developed to investigate the growth and equilibrium shape of a river delta in which wave action is the dominant force in redistributing sands. The models appear to yield reasonable comparisons with real beaches and delta shapes. The models indicate that the deltas quickly reach an equilibrium configuration in which the wave energy flux is just capable of transporting and redistributing along the shore all the sand supplied by the river. The wave breaker angle decreases systematically along the delta away from the river mouth due to a progressive decrease in the quantity of river sand remaining to be transported. When the wave energy flux is low or the river sediment supply too high for the existing waves nearly all the sand remains near the river mouth, producing one distributary which, if duplicated, would form a bird-foot delta. Oblique wave approaches produced asymmetric deltas, but the asymmetry was not as pronounced as anticipated. (Knapp-USGS)
W73-12592

BLACK PHYTOKARST FROM HELL, CAYMAN ISLANDS, BRITISH WEST INDIES,
Texas Univ., Austin. Dept. of Geology.
R. L. Folk, H. H. Roberts, and C. H. Moore.
Geological Society of America Bulletin, Vol 84, No 7, p 2351-2360, July 1973. 12 fig, 39 ref.

Descriptors: *Karst, *Algae, *Vegetation effects, *Weathering, Carbonate rocks, Geomorphology, Topography, Limestones, Dolomite.
Identifiers: *Cayman Islands, *Phytokarst.

Phytokarst is a distinctive landform resulting from a curious type of biologic erosion. Filamentous algae bore their way into limestone to produce black-coated, jagged pinnacles marked by delicate, lacy dissection that lacks any gravitational orientation. Ordinary rainfall-produced karst and littoral karst are characterized by flat-bottomed pans and vertically oriented flutes, thus differing from phytokarst. Algae attack by dissolving calcite preferentially to dolomite. (Knapp-USGS)
W73-12593

WIND-DRIVEN MODEL FOR EVAPORITE DEPOSITION IN A LAYERED SEA,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
W. D. Stuart.
Geological Society of America Bulletin, Vol 84, No 8, p 2691-2704, August 1973. 11 fig, 1 tab, 28 ref.

Descriptors: *Chemical precipitation, *Evaporation, *Salts, *Brines, *Mathematical models, Sea water, Numerical analysis, Finite element analysis, Water chemistry, Water circulation.
Identifiers: *Evaporites.

Deposition of evaporites in a salinity- and density-layered sea is examined by theoretically predicting the large-scale circulation in a simplified model sea. In the constant-depth model, vertical stratification is represented by two homogeneous layers; the upper layer is normal or slightly concentrated seawater, and the considerably denser lower layer is saturated with respect to halite. Each layer has a constant density and volume. The horizontal transport form of the time-dependent equations of motion and continuity for each layer are solved numerically by a finite-difference method. Interface stresses acting between the two layers and bottom stresses acting between the lower layer and the bottom allow consideration of vertical turbulent friction. Forcing is by a constant and uniform wind stress acting on the free surface. Rotation and hydrostatic pressure gradient terms are also included in the equations of motion. (Knapp-USGS)
W73-12594

LONG-LIVED POLLUTANTS IN SEDIMENTS FROM THE LAGUNA ATASCOSA NATIONAL WILDLIFE REFUGE, TEXAS,
Texas A and M Univ., College Station. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W73-12595

THEORY OF WATER MOVEMENT IN SOILS: 10. CAVITIES WITH CONSTANT FLUX,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
For primary bibliographic entry see Field 02G.
W73-12600

ERODIBILITY OF HILL SOILS OF SUTLEJ CATCHMENT AREA IN HIMACHAL PRADESH,
Indian Agricultural Research Inst., New Delhi. Div. of Soil Science and Agricultural Chemistry.
R. R. Sharma, and N. R. D. Biswas.
Indian J Agric Sci. Vol 42, No 2, p 161-169. 1972.
Identifiers: Catchments, Cation, Clay, Dispersion, *India, Sand, *Soils, Sutlej catchment, *Erosion ratios.

The mechanical composition and other physical and physicochemical properties of 4 soil profiles in the sub-watershed of Sirkhad, were determined. Erosion ratios of these soils were correlated with dispersion ratio, clay:moisture-equivalent ratio, fine sand:silt + clay ratio, sand:silt + clay ratio, fine sand:clay ratio, and with the cation exchange capacity of the soils. The high 'r' value indicates that the ratio of fine sand:silt clay may also be considered a suitable index to help the prediction of erodibility of these soils. Soils derived from shales show high erosion ratios on the surface, and consequently suffer from sheet erosion, in contrast to the gully erosion suffered by the soils derived from sandstones, which show higher ratios through the profile depth.--Copyright 1973, Biological Abstracts, Inc.
W73-12635

SEDIMENT RESULTING FROM CONSTRUCTION OF AN INTERSTATE HIGHWAY IN THE PIEDMONT AREA OF NORTH CAROLINA,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 04C.
W73-12713

A SUGGESTED NEW APPROACH TO THE ANALYSIS OF DRAINAGE BASIN SHAPES,
Monash Univ., Clayton (Australia).
For primary bibliographic entry see Field 04A.
W73-12729

OBSERVATIONS OF TUFA DEPOSITION,
Hull Univ. (England).
For primary bibliographic entry see Field 02K.
W73-12730

TERRACETTES: A SUGGESTED CLASSIFICATION,
Manchester Univ. (England).
E. W. Anderson.
Area (Institute of British Geographers), Vol 4, No 1, p 17-20, 1972. 7 ref.

Descriptors: *Geomorphology, *Slopes, *Grazing, *Erosion, Soil erosion, Terraces (Geologic), Topography.
Identifiers: *Terracettes, England, Scotland.

Terracettes, which are small breaks in slopes, are produced by grazing animals. Field measurements taken of terracette morphology allow a broad classification to be made. Two basic types can be distinguished: (1) normal terracettes with wide risers at a similar angle to that of the slope, and long, unbroken treads parallel to each other and normal to the slope; (2) tear terracettes with narrow, steep risers generally lacking in vegetation, and short treads which are rarely parallel or normal to the slope. Normal terracettes occur in areas of permanent pasture on predominantly mineral soils, while tear terracettes are usually found in areas of rough grazing where there is a marked organic horizon. (Knapp-USGS)
W73-12731

TRIALS ON TRENDS THROUGH CLUSTERS OF CIRQUES,
Monash Univ., Clayton (Australia).
G. Robinson.
Area (Institute of British Geographers), Vol 4, No 2, p 104-113, 1972. 2 fig, 5 tab, 22 ref.

Descriptors: *Cirques, *Snow, *Statistical methods, *Paleoclimatology, *Pleistocene epoch, Geomorphology, Correlation analysis, Variability, Glaciation.
Identifiers: *Snowlines.

When a Pleistocene snowline is plotted from a sampled population of cirque altitudes, the sampling unit by its very nature cannot be observed uniformly over space. The factors that favor a site's occupance and excavation by ice tend to produce clusters of cirques in particular parts of mountain ranges. Further, the locations of the mountain ranges are themselves frequently clustered. Thus, the total identified and measurable population of cirques studied in Tasmania is predominantly located in clusters of clusters. To examine the effects of reducing spatial clustering, a comparison is made between quadratic trend surfaces fitted to four samples of Tasmanian cirques with varying degrees of clustering, using direct correlation, analysis of variance, correlation of the trend parameters, and comparison of the reductions of sum of squares. No major differences among surfaces are revealed, and it is concluded that with a large number of highly clustered observations the empirical choice of control point distrubution depends more reasonably upon operational exigencies than upon the fear of distortion associated with clustering. (Knapp-USGS)
W73-12732

EXPERIMENTAL INVESTIGATION OF ROCK WEATHERING BY SALTS,
Oxford Univ. (England).
For primary bibliographic entry see Field 02K.
W73-12733

SOME EXAMPLES OF DRAINAGE COMPONENT ANALYSIS,
Malaya Univ., Kuala Lumpur (Malaysia).
For primary bibliographic entry see Field 04A.
W73-12734

A NOTE ON STREAM ORDERING,
University Coll. of Wales, Aberystwyth.
For primary bibliographic entry see Field 04A.
W73-12735

THE SUPERIMPOSITION HYPOTHESIS FOR INCISED MEANDERS--A GENERAL REJECTON AND SPECIFIC TEST,
Makerere Univ., Kampala (Uganda).
For primary bibliographic entry see Field 02E.
W73-12736

CLIMATIC CHANGE AND ARRESTED MEANDER DEVELOPMENT ON THE RIVER SEVERN,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 04A.
W73-12737

HISTORY OF SEDIMENTATION IN MONTSWEAG BAY,
Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service.
For primary bibliographic entry see Field 02L.
W73-12740

KARST OF THE ARABIKA MASSIF (KARST MASSIVA ARABIKA),
For primary bibliographic entry see Field 02K.
W73-12742

THE NITROGEN CYCLE IN SEDIMENT--WATER SYSTEMS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 05C.
W73-12843

CARBON CYCLE IN SEDIMENT-WATER SYSTEMS,
National Environmental Research Center, Corvallis, Oreg.
For primary bibliographic entry see Field 05C.
W73-12846

NITROGEN RELEASE FROM LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Program.
For primary bibliographic entry see Field 05B.
W73-12860

LITHIUM SILICATE SEDIMENTATION TRACER FOR SHOAL DEPOSIT STUDIES,
IIT Research Inst., Chicago, Ill.
For primary bibliographic entry see Field 05B.
W73-12862

THE REDUCTION OF COPPER TOXICITY IN A MARINE COPEPOD BY SEDIMENT EXTRACT,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 05C.
W73-12909

PHOSPHATE CHEMISTRY IN LAKE SEDIMENTS,
Massey Univ., Palmerston North (New Zealand).
For primary bibliographic entry see Field 05C.
W73-12917

DETERMINATION OF ALKYLBENZENESULFONATE (ABS) IN BOTTOM SEDIMENT,
Tokyo Metropolitan Univ., Tokyo. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-12932

STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL IN NEW JERSEY.

New Jersey State Soil Conservation Committee Publication, 1972. 116 p.

Descriptors: *Erosion control, *Sediment control, *Soil erosion, *Land development, *New Jersey, Urbanization, Sediment transport, Sedimentation, Water pollution, Bank protection, Check structures, Land management, Vegetation establishment, Slope stability.
Identifiers: *Erosion control guidelines.

The last several decades of rapid suburban development in the state of New Jersey have resulted in the erosion of soil by both wind and water. Standards and recommendations are presented to provide local governments, developers, and technical personnel with erosion control techniques. Effective erosion control begins in the project planning stage. Proper planning requires consideration of water control and soils to be encountered in order to reduce erosion problems during and after construction. Steep slopes, potential landslide areas, stream crossings, stream encroachments, and cut and fill sections should be evaluated for construction problems involved in reducing erosion and the resulting sediment damage to streams and water supplies. The evaluation of soils, existing vegetation, and geologic and hydrologic data is necessary to define problem areas. Every consideration should be given to assure the successful establishment of vegetation on disturbed areas as quickly as possible in order to minimize erosion and sediment damage. (Woodard-USGS)
W73-12956

CHANNEL EROSION SURVEYS ALONG PROPOSED TAPS ROUTE, ALASKA, JULY 1971,
Geological Survey, Anchorage, Alaska.
J. M. Childers.
Basic-data report, October 1972. 79 p, 62 fig, 1 tab, 8 ref.

Descriptors: *Channel erosion, *Pipelines, *Oil industry, *Alaska, Environmental effects, Conveyance structures, Oil, Surveys, Aerial photography, Planning, Sediment transport, Sediment control, Erosion control, Storms, Stream erosion, Streambeds, Evaluation, Data collections, Engineering.
Identifiers: *Trans-Alaska Pipeline System, Preconstruction data.

The U.S. Geological Survey has the threefold responsibility along the proposed route of the Trans-Alaska Pipeline System (TAPS) to investigate possible hydrologic hazards to the pipeline, to investigate possible impacts of the pipeline on water resources, and to develop a better understanding of Arctic hydrology. Because the proposed pipeline route lies within many stream channels, one of the obvious hydrologic hazards is channel erosion. Descriptions of preconstruction conditions are provided at selected channel sites along the northern segment of the TAPS from Prudhoe Bay to the Salcha River. The information could be used in studies of severe channel erosion, streambed scour, bank erosion, or rechannelization. Included is a plan for detecting and measuring significant erosion and the important factors causing the erosion, such as flood discharge, icing, and construction activities. Vertical aerial photography at most sites was obtained during low-flow, open-water conditions to provide a basis for evaluating changes that may be caused by construction and erosion. (Woodard-USGS)
W73-12957

TRACE METAL BASELINE STUDIES ON THE MURDERKILL AND ST JONES RIVERS, DELAWARE COASTAL PLAIN,
Delaware Univ., Newark. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W73-12959

2K. Chemical Processes

SELECTED DATA ON WELLS IN THE BARSTOW AREA, MOJAVE RIVER BASIN, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 04B.
W73-12421

THE EVALUATION OF EXISTING FIELD TEST KITS FOR DETERMINING FREE CHLORINE RESIDUALS IN AQUEOUS SOLUTIONS,
Army Medical Environmental Engineering Research Unit, Edgewood Arsenal, Md.
For primary bibliographic entry see Field 05A.
W73-12426

HYDROLOGICAL YEAR-BOOK OF ISRAEL, 1970/71.
Ministry of Agriculture, Jerusalem (Israel). Water Commission.
For primary bibliographic entry see Field 02A.
W73-12432

TRITIUM MEASUREMENT OF NATURAL WATERS ON OAHU, HAWAII: A PRELIMINARY INTERPRETATION (SAMPLING PERIOD: JULY 1969 TO JUNE 1970),
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 05A.
W73-12499

SETTLEABLE MATTER IN WASTE WATER. SCAN-W7:72.
Scandinavian Pulp, Paper and Board Testing Committee, Stockholm (Sweden).
For primary bibliographic entry see Field 05A.
W73-12530

DETERMINATION OF ORGANIC SUBSTANCES IN INDUSTRIAL EFFLUENTS (NEKTERE MOZNOSTI STANOVENI ORGANICKEHO ZNECISTENI ODPADNICH VOD),
IRAPA, Prague (Czechoslovakia).
For primary bibliographic entry see Field 05A.
W73-12532

GROUND-WATER RESOURCES, NELSON AND WALSH COUNTIES, NORTH DAKOTA,
Geological Survey, Grand Forks, N. Dak.
For primary bibliographic entry see Field 02F.
W73-12578

BLACK PHYTOKARST FROM HELL, CAYMAN ISLANDS, BRITISH WEST INDIES,
Texas Univ., Austin. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W73-12593

WIND-DRIVEN MODEL FOR EVAPORITE DEPOSITION IN A LAYERED SEA,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02J.
W73-12594

UPPER CHESAPEAKE BAY WATER QUALITY STUDIES, 1968-1971.
Environmental Protection Agency, Annapolis, Md. Field Office.
For primary bibliographic entry see Field 05A.
W73-12601

INVESTIGATION OF MINERAL NUTRIENT CYCLING IN UPLAND PIEDMONT FOREST,
Forest Service (USDA), Research Triangle Park, N.C. Forest Science Lab.
For primary bibliographic entry see Field 04A.
W73-12700

WATER QUALITY IN THE MIDDLE FORK FEATHER RIVER, CALIFORNIA, MAY 1970 THROUGH SEPTEMBER 1971,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 05A.
W73-12720

OBSERVATIONS OF TUFA DEPOSITION,
Hull Univ. (England).
A. F. Pitty.
Area (Institute of British Geographers), Vol 3, No 3, p 185-189, 1971. 1 fig, 1 tab, 18 ref.

Descriptors: *Calcium carbonate, *Chemical precipitation, *Mosses, Limestones, Carbon dioxide, Water chemistry.
Identifiers: *Tufa.

Tufa formation seems always to be associated with the presence of either mosses or algae. The seasonal change in response of plant activity to varying intensities of radiant energy supply may be detected in the process of tufa deposition. In many situations, therefore, palaeoclimatic reconstructions of the environment in which fossil tufas accumulated should consider the effect of varying climatic conditions on the activity of tufa-depositing organisms as well as inferring how such changes might affect purely physicochemical processes that could theoretically be involved in tufa deposition. For instance, features of the maritime climate in Britain, especially the high precipitation and mild temperatures without extremes, contribute to the luxuriant growth of mosses. In particular, seasonal contrasts in calcium carbonate deposition are emphasized, and it is suggested that their study is one of the best ways of approaching the problem of specifying the conditions favoring or retarding tufa deposition over contrasted but much longer spans of Quaternary time. (Knapp-USGS)
W73-12730

EXPERIMENTAL INVESTIGATION OF ROCK WEATHERING BY SALTS,
Oxford Univ. (England).
A. Goudie, R. Cooke, and I. Evans.
Area (Institute of British Geographers), No 4, p 42-48, 1970. 3 fig, 1 tab, 7 ref.

Descriptors: *Weathering, *Salts, *Water chemistry, Hydration, Crystallization, Rock properties.

Disintegration of rocks by salts, which takes place in such diverse environments as deserts, coasts, polar areas, lakeshore, and cities, is accomplished by three principal processes: growth of crystals from solution, expansion on hydration, and thermal expansion. A series of experiments was designed to explore certain aspects of these problems. Rock samples of approximately similar initial weight, shape, and size were immersed in saturated salt solution at 17-20 deg C for one hour. They were then removed and dried in an oven, using a temperature of 60 deg C for six hours, and a temperature of 30 deg C for the remainder of each 24-hour cycle. The procedure was repeated 40 times. Na2S04 was consistently the most effective salt in causing splitting. Only sedimentary rocks were affected by splitting. Weight losses through splitting of granular disintegration by salt crystallization reflect the influence of a large number of variables. Environmental variables include the salts involved and their concentrations, the thermal regime, degree of supersaturation reached, and duration of exposure to supersaturated solutions. The effect of different salts is a function of such properties as volume increase on crystallization, rate of change of solubility with temperature, and thermal coefficients of volumetric expansion. Relevant rock properties include percentage absorption of solution, rate of solution penetration and other properties related to these, tensile strength, the nature and distribution of structural weakness, and geometric attributes of the specimens. (Knapp-USGS)
W73-12733

BIOGEOCHEMISTRY OF SEDIMENTS OF DELAWARE BAY,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 02L.
W73-12739

KARST OF THE ARABIKA MASSIF (KARST MASSIVA ARABIKA),
T. Z. Kiknadze.
Izdatel'stvo 'Metsniyereba', Tbilisi, 1972. 248 p.

Descriptors: *Karst, *Karst hydrology, *Mountains, Geology, Geologic history, Geologic time, Geomorphology, Topography, Petrology, Stratigraphy, Hydrogeology, Groundwater, Water chemistry, Corrosion, Caves, Limestones, Subsurface drainage, Snow, Ice, Maps.
Identifiers: *USSR (*Abkhazia), *Arabika massif, Karst landforms, Tectonics.

Investigations were carried out in northwestern Abkhazia in 1960-68 to study geological and hydrogeological conditions of karst development on the Arabika massif, one of the most comples karst regions in the world. Data on chemical erosion in the region are tabulated and mapped, and karst landforms and factors controlling development of karst (tectonics, chemical composition of rocks, lithology, and soil-vegetal cover) are described. (Josefson-USGS)
W73-12742

HYDROCHEMICAL DESCRIPTION OF THE ONON-ARGUN' STEPPE (GIDROKHIMICHESKAYA KHARAKTERISTIKA ONON--ARGUNSKOY STEPI),
Institute of Geography of Siberia and the Far East, Irkutsk (USSR).
V. A. Snytko, and V. A. Alekseyenko.
Institut Geografii Sibiri i Dal'nego Vostoka Doklady, No 30, p 37-44, 1971. 2 fig, 4 tab, 14 ref.

Descriptors: *Water chemistry, *Water quality, *Water analysis, *Inorganic compounds, *Grasslands, Rivers, Lakes, Groundwater, Ions, Hardness (Water), Salinity, Temperature.
Identifiers: *East Siberia, *Chita Oblast, *Onon-Argun' steppe, Mineralization.

Delineation of the Onon-Argun' steppe into hydrochemical zones was based on detailed investigations of chemical composition of natural waters in southeastern Chita Oblast in 1968-70. Seven zones were identified: (1) Onon region of calcium bicarbonate waters: (2) Torey region of sodium bicarbonate waters; (3) Borzya region of bicarbonate sulfate waters; (4) Kharanor region of sodium chloride waters; (5) Nerchnisk region of calcium bicarbonate waters; (6) Klichka region of magnesium bicarbonate waters; and (7) Argun' region of calcium bicarbonate waters. Quality-of-water data are presented for the different regions. (Josefson-USGS)
W73-12746

SILICA IN THERMAL AND COLD WATERS (KREMNEZEM V TERMAL'NYKH I KHOLODNYKH VODAKH),
G. V. Bogomolov, G. N. Plotnikova, and Ye. A. Titova.
Izdatel'stvo 'Nauka', Moscow, 1967. 112 p.

Descriptors: *Geochemistry, *Silica, *Water types, *Groundwater, *Thermal water, Mineral water, Springs, Hot springs, Geysers, Cold springs, Freshwater, Wells, Artesian aquifers, Structural geology, Water temperature, Carbon dioxide, Solubility, Hydrogen ion concentration, Chemical analysis, Sampling.
Identifiers: *USSR, Mineral springs, Mineralization, Tectonics.

Silica concentrations in thermal and cold groundwaters were investigated in platform and folded-mountain areas of the USSR and in individual foreign countries. Solubility of silica, modes of its migration in water, and basic factors affecting passage of silica into natural waters are described, and maximum concentrations of silica are given for different groundwater types. The data obtained are important in evaluating the role of groundwater in migration and redistribution of silica in the earth's crust. (Josefson-USGS)
W73-12751

DETERMINATION OF EXCHANGEABLE CATIONS IN CALCAREOUS SOILS,
Centro de Edafologia y Biologia Aplicada del Segura, Murcia (Spain).
For primary bibliographic entry see Field 02G.
W73-12786

RAPID FIELD DETERMINATION OF NITRATE IN NATURAL WATERS,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
T. A. Ranney, and R. J. Bartlett.
Commun Soil Sci Plant Anal. Vol 3, No 3, p 183-186. 1972.
Identifiers: *Brucine, *Nitrates, Soils, Soil extracts.

Brucine, an organic reagent used for nitrate determinations, proved stable for at least 1 yr when dissolved in methanol. This makes possible a consistently accurate and rapid method for field determinations of nitrate in clear solutions with a minimum of equipment. The method is also useful in the laboratory for determining nitrate in water or soil extracts. It is quicker and simpler than other colorimetric methods and more sensitive to low concentrations than the nitrate electrode.–Copyright 1972, Biological Abstracts, Inc.
W73-12810

PHOTOSULFOXIDATION OF HYDROCARBONS IN THE LIQUID PHASE,
Battelle Columbus Labs., Ohio.
P. W. Jones, and A. H. Adelman.
Environ Sci Technol. Vol 6, No 10, p 933-934. 1972. Illus.
Identifiers: Carbons, *Hydro carbons, Liquid phase, Oxidation, *Photo sulfoxidation, Quenching, Sulfur.

Aliphatic alkanes and alkenes were irradiated with UV light (Lambda ± or > 2900 A) in the liquid phase, in the presence of SO2 and O2. Both the hydrocarbon reactivity and the nature of products formed in solution show significant similarities to experiments involving aerosols under atmospheric conditions. However, studies in the former system are greatly facilitated by the superior yield of products. The mechanism of triplet SO2 quenching, to form photosulfoxidation products, is duscussed.–Copyright 1973, Biological Abstracts, Inc.
W73-12833

VOLTAMMETRIC STUDY OF THE HYDROGEN ION/HYDROGEN COUPLE IN ACETONITRILE/WATER MIXTURES,
Tennessee Univ., Knoxville. Dept. of Chemistry.
J. A. Lanning, and J. Q. Chambers.
Analytical Chemistry, Vol 45, No 7, p 1010-1016, June 1973. 7 fig, 3 tab, 48 ref.

Descriptors: *Electrochemistry, *Aqueous solutions, Chemical reactions, Chemical analysis, Solvents.
Identifiers: *Perchloric acid, *Voltammetry, *Nonaqueous solutions, *Platinum electrodes, *Mixtures, Acetonitrile, Reproducibility, p-Benzohydroquinone, Proton diffusion coefficients.

A voltammetric study at polished platinum electrodes of perchloric acid in acetonitrile/water mixtures is reported. The half-wave potentials of the proton reduction wave (ferrocene scale) and the viscosity of acetonitrile/water mixtures indicate that acetonitrile structures water in the 0.80 to 0.95 mol fraction of water region. The proton is most difficult to reduce (E sub 1/2 most negative) at 0.85 mol fraction of water. Acetonitrile proved to be a poor solvent for the generation of dry protons. Chemical reactions occur in H (plus)/H2/CH3CN mixtures which depend on the nature of the generation technique employed. Solvent effects effects on the cyclic voltammograms of p-hydrobenzoquinone in acetonitrile-water mixtures were used to aid in the identification of product reduction waves. The wave assigned to the reduction of protonated benzoquinone was independent of solvent composition, in marked contrast to the reduction of solvated protons. (Holoman-Battelle)
W73-12872

SODIUM TUNGSTEN BRONZE AS A POTENTIOMETRIC INDICATING ELECTRODE FOR DISSOLVED OXYGEN IN AQUEOUS SOLUTION,
Ames Lab., Iowa.
For primary bibliographic entry see Field 05A.
W73-12873

INSTRUMENTAL AND NUMERICAL CONSIDERATIONS FOR ON-LINE INTERPRETATION OF HIGH RESOLUTION MASS SPECTRAL DATA,
Wisconsin Univ., Madison. Dept. of Chemistry.
R. M. Hilmer, and J. W. Taylor.
Analytical Chemistry, Vol 45, No 7, p 1031-1045, June 1973. 9 fig, 5 tab, 23 ref.

Descriptors: *Data processing, *Computer programs, *Mass spectometry, *Pollutant identification, Computers, Electronic equipment, Instrumentation.
Identifiers: Mass spectra.

Several important instrumental characteristics of an AEI-MS9 double focusing mass spectometer in the Nier-Johnson configuration are discussed which influence the choice of techniques for on-line data acquistion and numerical methodology for high resolution mass spectral data processing. The approach described yields an average error of less than 10 ppm in mass measurement, and peaks as small as 0.05 percent of the tallest peak are observed. Instrument vibration raises the average mass error. Values below 3 ppm are obtained from data where vibration isolation has been attempted. The time of execution of the data reduction is about 3-10 min on the Raytheon 706 computer, and about 15-60 sec per spectrum on the Univac 1108. The computing times depend on the number of multiplet peaks to be deconvoluted, the number of peaks in the spectrum, and the number of atoms allowed in the elemental formulas. (Little-Battelle)
W73-12874

POLYAROMATIC HYDROCARBONS IN HIGH-BOILING PETROLEUM DISTILLATES. ISOLATION BY GEL PERMEATION CHROMATOGRAPHY AND IDENTIFICATION BY FLUORESCENCE SPECTROMETRY,
Bureau of Mines, Laramie, Wyo. Laramie Energy Research Center.
For primary bibliographic entry see Field 05A.
W73-12875

OPTIMUM PROCEDURE FOR THE DETERMINATION OF SELENIUM IN BIOLOGICAL SPECIMENS USING SE-77M NEUTRON ACTIVATION,
Veterans Administration Hospital, Omaha, Nebr.
For primary bibliographic entry see Field 05A.
W73-12876

TOTAL MERCURY ANALYSIS: REVIEW AND CRITIQUE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 05A.
W73-12885

SPECTROPHOTOMETRIC DETERMINATION OF AMMONIA,
Cham/Hill, Corvallis, Oreg.
For primary bibliographic entry see Field 05A.
W73-12886

ANALYTICAL REVIEWS 1973/APPLICATIONS.
For primary bibliographic entry see Field 05A.
W73-12930

DETERMINATION OF URANIUM IN URINE SPECIMENS FOLLOWING THEIR SEPARATION THROUGH ANION EXCHANGE, (BESTIMMUNG DES URANS IN URINPROBEN NACH DESSEN ABTRENNUNG DURCH ANIONENAUSTAUSCH),
Vienna Univ. (Austria). Analytisches Institut.
For primary bibliographic entry see Field 05A.
W73-12931

DETERMINATION OF AMMONIUM IN SOIL EXTRACTS AND WATER SAMPLES BY AN AMMONIA ELECTRODE,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W73-12939

RADIOCHEMICAL MONITORING OF WATER AFTER THE CANNIKIN EVENT, AMCHITKA ISLAND, ALASKA, OCTOBER, 1972,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 05B.
W73-12945

SOURCES OF DATA FOR EVALUATION OF SELECTED GEOTHERMAL AREAS IN NORTHERN AND CENTRAL NEVADA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04B.
W73-12947

SOLUBLE SILICA AND FLUORIDE IN SOME SURFACE AND GROUND WATERS OF MYSORE STATE,
University of Agricultural Sciences, Bangalore (India). Dept. of Chemistry and Soils.
P. B. Deshpande, and B. V. Venkata Rao.
Mysore J Agric Sci, Vol 6, No 2, p 107-113, 1973.
Identifiers: *Fluorides, Ground (Water), *India (Mysore), *Silica, Surface waters.

The pH, electrical conductivity, soluble silica and soluble fluoride were studied in relation to the geologic nature of the area. Well waters were slightly acidic or neutral in reaction; well waters located in granite and granite-gneissic area had a high fluoride concentration. Soluble silica in most of the ground waters was more than 2.0 ppm, an indication the equilibration of waters with the 2-phase system of kaolinite-montmorillonite formed during the weathering of silicate minerals. Tank waters were characterized by low silica content due to precipitation of soluble silica with calcareous or ferruginous sediments over which the impounded waters traverse.--Copyright 1973, Biological Abstracts, Inc.
W73-12969

2L. Estuaries

A CAGE FOR EXPOSING AQUATIC ANIMALS TO BOTTOM SEDIMENTS,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Lab.
P. T. Heitmuller, and D. R. Nimmo.
Prog Fish-Cult. Vol 34, No 2, p 120. 1972. Illus.
Identifiers: *Aquatic animals, *Bottom sediments (Estuarine), Cage, Sediments, *Shrimp, Estuaries, Organic pollutants.

A holding cage was constructed to assess uptake of organic pollutants from estuarine bottom sediments by penaeid shrimp in the field. The cage was a 2-tier redwood frame covered with hardware cloth and weighted to give it stability in tidal currents encountered in Escambia Bay, Florida. The design features a chamber where control animals are held above while experimental animals are in direct contact with the bottom sediments. Thirty 3-in. shrimp were successfully held in one of these cages for 3 wk.--Copyright 1972, Biological Abstracts, Inc.
W73-12372

A RECORD OF PACIFIC HERRING (CLUPEA HARENGUS PALLASI) FEEDING ON JUVENILE CHINOOK SALMON (ONCORHYNCHUS TSHAWYTSCHA) IN A BRITISH COLUMBIA ESTUARY,
Far Seas Fisheries Research Lab., Shimizu (Japan).
J. Ito, and R. R. Parker.
J Fish Res Board Can. Vol 28, No 12, p 1921. 1972.
Identifiers: *Canada (British Columbia estuary), Chinook salmon, Clupea-harengus-Pallasi, Estuaries, *Feeding habits (Herring), Herring, Juveniles, Oncorhynchus-tshawytscha, *Pacific herring, Salmon, Predator-prey relationships.

An occurrence of C. harengus pallasi predation on juvenile O. tshawytscha is described. This is the first recorded incidence of this particular predator-prey relation.--Copyright 1972, Biological Abstracts, Inc.
W73-12375

CORRELATED LIGHT AND ELECTRON MICROSCOPE STUDIES ON BROWN ALGAE. II. PHYSODE PRODUCTION IN DICTYOTA,
Leeds Univ. (England). Dept. of Plant Sciences.
For primary bibliographic entry see Field 05C.
W73-12388

BIOLOGY OF ROCK CRAB (CANCER IRRORATUS) IN NORTHUMBERLAND STRAIT,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
D. J. Scarratt, and R. Lowe.
J Fish Res Board Can. Vol 29, No 2, p 161-166. 1972. Illus.
Identifiers: Biology, Cancer-Irroratus, *Crabs, Mussels, *Canada (Northumberland Strait), Polychaetes, Populations, Prey, *Rock crab, Sea-Urchin, Starfish.

Divers hand-collected 342 C. irroratus ranging from 4.2 mm carapace width to 97 mm (females) and 127 mm (males). The sex ratio (1.37:1) was biased in favor of males. Of 2929 crabs taken in commercial lobster fishing gear, 92% were above the minimum commercial size of 89 mm, and of these 99.1% were male. Smallest size at maturity was 69 mm for females and 60 mm for males. Breeding occurred in late summer and fall. Larvae were present in surface waters from June to Sept. Pey of crabs >25 mm consisted principally of polychaetes, mussels, starfish, and sea urchins. Crabs less than about 65 mm inhabit rocky areas; larger crabs move out onto sand and mud. The

fishable population is probably not in significant competition with lobsters for food or space.—Copyright 1972, Biological Abstracts, Inc.
W73-12390

PROCEEDINGS OF SEMINAR ON EUTROPHICATION AND BIOSTIMULATION.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 05C.
W73-12391

NUTRIENT CONTROL IN NORTH SAN FRANCISCO BAY,
Brown and Caldwell, Inc., San Francisco, Calif.
For primary bibliographic entry see Field 05C.
W73-12398

MATHEMATICAL MODELING OF PHYTOPLANKTON POPULATIONS,
Hydroscience, Inc., Westwood, N.J.
For primary bibliographic entry see Field 05C.
W73-12399

AGP STUDIES IN THE SAN FRANCISCO BAY--DELTA,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 05C.
W73-12401

CHARACTERISTIC PHYSICAL AND BIOGENIC SEDIMENTARY STRUCTURES IN GEORGIA ESTUARIES,
Skidaway Inst. of Oceanography, Savannah, Ga.
J. D. Howard, and R. W. Frey.
American Association of Petroleum Geologists Bulletin, Vol 57, No 7, p 1169-1184, July 1973. 10 fig, 36 ref. NSF Grants GA-719 and GA-10888.

Descriptors: *Estuaries, *Georgia, *Sedimentary structures, Sand waves, Ripple marks, Sedimentology, Benthos, Sedimentation, Particle size, Sands, Silts, Mud, Gravels, Salt marshes.
Identifiers: *Bioturbation.

Estuaries of the Georgia coast contain a wide variety of sedimentary textures and physical and biogenic sedimentary structures. Sediment grain sizes range from fine mud to pebbles. Physical sedimentary structures include small- to large-scale sets of parallel-, ripple-, and cross-laminae. Biogenic structures include abundant burrows and bioturbations by many marine invertebrate organisms. Very fine-grained sediments tend to accumulate near the ocean, regardless of substantial sand sources far upstream. Pleistocene sand outcrops are very important locally, expecially near the ocean. Tests and shells generally are scarce. Ebb-current flow structures predominate over flood-current flow structures. Diversity and abundance of biogenic sedimentary structures decrease both landward and toward the deeper parts of estuarine channels. Muds generally contain distinct burrows, whereas sands may contain both discrete burrows and more general bioturbation. (Knapp-USGS)
W73-12410

LONG WAVE PROPAGATION IN IDEALIZED ESTUARY,
Birmingham Univ. (England). Dept. of Civil Engineering.
D. W. Knight.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY7, Paper 9842, p 993-1007, July 1973. 13 fig, 3 ref, append.

Descriptors: *Estuaries, *Waves (Water), *Tides, *Seiches, Numerical analysis, Unsteady flow, Tidal waters, Model studies, Equations, Hydrodynamics.

An analytical solution is given for equations written by Proudman to describe motion in an idealized estuary. In the idealized estuary, the channel is horizontal, of constant rectangular section, closed at one end and open at the other to tidal influence. The motion is one-dimensional, and the solution includes the effects of both the convective acceleration and friction terms. The solutions are developed in terms of working expressions for the tidal elevation and velocity at any point in the estuary. The limitations of this second-order solution are given in graphical form, in terms of four dimensionless numbers. Finally, the solution is compared with that obtained by solving 'Telegraphers' equation, and Proudman's solution is found to be more satisfactory. (Knapp-USGS)
W73-12417

PROCESS-FORM VARIABILITY OF MULTICLASS COASTS: BAJA CALIFORNIA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
L. D. Wright, H. H. Roberts, J. M. Coleman, R. L. Kupfer, and L. W. Bowden.
Available from NTIS, Springfield, Va. 22151 as AD-756 676 - Price $3.00 printed copy; $1.45 microfiche. Technical Report No 137, February 1973. 54 p, 19 fig, 22 photo, 2 tab, 31 ref.

Descriptors: *Coasts, *Geomorphology, *Land forming, *Mexico, *Pacific Ocean, Gulfs, Beaches, Littoral drift, Ocean waves, Ocean currents, Tidal effects, Waves (Water), Correlation analysis.
Identifiers: *Baja California (Mexico), *Gulf of California.

The coast of Baja California, Mexico, experiences two zonal process environments: the high-wave-energy Pacific coastal environment and the low-wave-energy, structure-dominated Gulf of California coastal environment. Both zones exhibit characteristic coastal landscapes reflecting the zonal environments. Along the Pacific coast a combination of high wave power, unidirectional littoral drift, and a series of right-lateral strike-slip faults parallel to the deepwater wave power results in extensive unbroken beaches and barrier-lagoon complexes alternating with rocky cliffs. Intrazonal variability is less pronounced along the Gulf of California coast. Because it is adjacent to a plate spreading center, this coast is tectonically juvenile, lacking a continental shelf and having precipitous offshore slopes. This situation, combined with the fact that waves are weak and variable in direction, has yielded a straight, cliffed coastline without long beaches. (Woodard-USGS)
W73-12422

OBSERVATIONS OF INTERMEDIATE AND SMALL SCALE TURBULENT WATER MOTION IN A STRATIFIED ESTUARY (PARTS I AND II),
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
R. C. Seitz.
Available from NTIS, Springfield, Va. 22151 as AD-756 252 - Price $3.00 printed copy; $1.45 microfiche. Technical Report 79, Reference 73-2, January 1973. 247 p, 24 fig, 13 tab, 83 ref, 2 append. NOAA N00014-67-A-0163-0006.

Descriptors: *Estuaries, *Turbulent flow, *Stratified flow, *Current meters, *Maryland, Tidal streams, Flow measurement, Density stratification, Instrumentation, Remote sensing.
Identifiers: *Patuxent estuary (Md), Doppler shift current meter.

In May 1967 a series of measurements of 3-dimensional convected turbulent flow (scales of motion ranging from greater than 100 meters to 0.1 meters) were made in the Patuxent estuary, Maryland, with a 3-axis doppler shift (acoustic) type of current meter. Experimental design, instrumentation doppler meter noise, hydrography, and a general theory for sampling of convected fields of turbulence are discussed. The study is also concerned with the general theory of 3-dimensional fields of turbulence in stratified estuaries and the results of extensive spectral and statistical calculations on five of the records of turbulence. The effects of the estuary boundary are shown in the low wave number anisotropy; spectrally local anisotropy induced by the field of stratified density in the estuary is also shown and quantitatively related to the amount of density stratification at the depth of observation. The likelihood of high wave-number isotropic turbulence is shown and the transition wave-number denoting its onset is emperically related to the local Richardson number of the flow. Five of the doppler meter records were computer filtered so that the characteristics of the high wave-number velocity field could be determined; noted amounts of patchiness or intermittency of the filtered records of velocity was observed. The flatness of the filtered velocity records increased rapidly as a function of the local Richardson number. The structure of the average 'patches' of turbulence together with other characteristics of the small-scale motion in the estuary is discussed in terms of the theory for shear instability. (Woodard-USGS)
W73-12424

THE COMPUTATION OF TIDES AND CURRENTS IN ESTUARIES AND CANALS,
Massachusetts Inst. of Tech., Cambridge. Hydrodynamics Lab.
D. R. F. Harlemen, and C. H. Lee.
Available from NTIS, Springfield, Va. 22151 as AD-756 136 - Price $3.00 printed copy; $1.45 microfiche. Army Corps of Engineers Committee on Tidal Hydraulics Technical Bulletin No 16, September 1969. 276 p, 105 fig, 5 tab, 43 ref, 3 append. ACE DA-22-079-civeng-66-17.

Descriptors: *Hydrologic aspects, *Estuaries, *Canals, *Tidal effects, Analytical techniques, Numerical analysis, Equations, Channel morphology, Saline water intrusion, Currents (Water), Runoff, Flow rates, Diurnal, Water level fluctuations, Tides, Tidal streams, Inland waterways, Computer programs.

The analysis of one-dimensional tidal motion is described in the two principal types of tidal waterways: (1) estuaries open to the ocean at one end and merging with a river at the opposite end; and (2) canals or waterways connecting two independent tidal bodies. The objectives were to classify tidal problems. The primary concern was with analytical and numerical methods rather than with analog and physical models. In general, only one-dimensional methods were considered since these are adequate for many practical problems. Tidal motion in a canal or estuary can be described by two equations, one expressing the conservation of mass (the continuity equation), and the other expressing the dynamic equation of motion in the longitudinal direction (the momentum equation). The various ways of dealing with these two equations are: (1) harmonic methods; (2) method of characteristics; and (3) finite difference methods. The nonlinear, finite difference method proved to be the most satisfactory for solution of one-dimensional tidal hydraulic problems. Seven case studies are given to demonstrate the versatility of the method in both prismatic and irregular channels, in closed and open end estuaries and sea level canals. The diagonal mesh computation method using an explicit scheme results in relatively simple computer programs and efficiency in computer time. Computer programs have been developed for closed end estuaries, open end estuaries, and sea level canals. (Woodard-USGS)
W73-12428

FINAL ENVIRONMENTAL STATEMENT: SMALL BEACH EROSION CONTROL PROJECT, BROADKILL BEACH, DELAWARE.
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 08B.

W73-12430

CLASSIFICATION OF COASTAL ENVIRONMENTS, PROCEDURES AND GUIDELINES,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
R. Dolan, and B. P. Hayden.
Available from NTIS, Springfield, Va 22151 as AD-757-798 Price $3.00 printed copy; $1.45 microfiche. Technical Report No 2, February 1973. 41 p, 2 fig, 6 tab, 21 ref. ONR N00014-69-A-0060-0006.

Descriptors: *Coasts, *Geomorphology, *Classification, Climate, Air masses, Land forming, Environment, Environmental effects, Sediment transport, Beach erosion, Littoral drift, Geology.

Considerable work in the analysis and classification of coasts from a geologic or geomorphologic perspective has been reported. The best information available is descriptive, and it was decided that those descriptive attributes which reflect and are responsive to ongoing processes form a solid base for the classification of coastal interfaces. Three attribute classes of the coastal interface were found to be reflective of ongoing interface processes: gross form of the coastal interface; chemical composition of the coastal interface; and size character of interface materials. All coastal interfaces have each of these three attributes and differ only in specifics. Some coastal interfaces have two attributes such as sand and rock material sizes in a specific configuration as in a coast of pocket beaches or sand beaches with rock headlands. In these cases both characters are included in the classification. In total, 15 classes of interfaces were found. (Woodard-USGS)
W73-12433

DELAWARE ESTUARY, PENNSYLVANIA, NEW JERSEY, AND DELAWARE, LONG--RANGE DREDGED SPOIL DISPOSAL PROBLEM.
Committee on Tidal Hydraulics (Army), Washington, D.C.
For primary bibliographic entry see Field 05E.
W73-12560

ESTUARINE NAVIGATION PROJECTS.
Committee on Tidal Hydraulics (Army), Washington, D.C.
For primary bibliographic entry see Field 08B.
W73-12575

GRAYS HARBOR ESTUARY, WASHINGTON: REPORT 2. NORTH JETTY STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W73-12581

FORECASTING STORM-INDUCED BEACH CHANGES ALONG VIRGINIA'S OCEAN COAST,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 04A.
W73-12584

SEA FLOOR OFF MAGDALENA DELTA AND SANTA MARTA AREA, COLOMBIA,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 02J.
W73-12591

COMPUTER MODELS OF DELTA GROWTH DUE TO SEDIMENT INPUT FROM RIVERS AND LONGSHORE TRANSPORT,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 02J.
W73-12592

LONG-LIVED POLLUTANTS IN SEDIMENTS FROM THE LAGUNA ATASCOSA NATIONAL WILDLIFE REFUGE, TEXAS,
Texas A and M Univ., College Station. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W73-12595

UPPER CHESAPEAKE BAY WATER QUALITY STUDIES, 1968-1971.
Environmental Protection Agency, Annapolis, Md. Field Office.
For primary bibliographic entry see Field 05A.
W73-12601

HEAVY METALS IN ESTUARIES AND THE COASTAL ZONE,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 05B.
W73-12606

THE ZOOPLANKTON OF THE GULF OF GUINEA,
For primary bibliographic entry see Field 05A.
W73-12623

AN INTERDISCIPLINARY STUDY OF THE ESTUARINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS,
Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
For primary bibliographic entry see Field 05A.
W73-12629

THE EFFECT OF FLOODWATER ON OYSTERS IN MOBILE BAY,
Alabama Marine Resources Lab., Dauphin Island.
For primary bibliographic entry see Field 05C.
W73-12658

BACTERIA OF MUDS COLONIZED BY SPARTINA TOWNSENDII AND THEIR POSSIBLE ROLE IN SPARTINA DIE-BACK,
Commonwealth Mycological Inst., Kew (England).
A. Sivanesan, and J. G. Manners.
Plant Soil. Vol 36, No 2, p 349-361, 1972. Illus.
Identifiers: *Bacteria, *Muds, *Spartina-Mdieback, Spartina-Townsendii-M, *England (Lymington estuary), Estuaries.

A study of the bacterial microflora of muds colonized by Spartina townsendii agg. in healthy and 'die-back' sites in the Lymington estuary was made. No important qualitative differences were found between the microfloras of the 2 types of site. Fewer species, however, were present in the die-back sites. It is suggested that under anaerobic conditions, such as occur in a 'die-back' site, the bacteria will utilize such oxygen as is present, and will then engage in anaerobic metabolic processes, producing reduced ions which will reduce the oxidation-reduction potential still further. The occurrence of abundant sulfate reducers in the 'die-back' sites may be particularly significant in this respect. No evidence was obtained of any more direct relationship between bacterial flora and the development of 'die-back'.--Copyright 1972, Biological Abstracts, Inc.
W73-12705

LIPIDS IN SHALLOW BOTTOM SEDIMENTS,
Harvard Univ., Cambridge, Mass. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W73-12717

PREDICTION OF UNSTEADY SALINITY INTRUSION IN ESTUARIES: MATHEMATICAL MODEL AND USER'S MANUAL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
M. L. Thatcher, and D. R. F. Harleman.
Available from NTIS, Springfield, Va 22151 as COM-73-10543 Price $3.00 printed copy; $1.45 microfiche. Massachusetts Institute of Technology Sea Grant Project Office Report No MITSG 72-21, November 30, 1972. 117 p, 11 fig, 7 tab, 5 ref, 3 append. NOAA Sea Grants GH-88 and 2-35150.

Descriptors: *Saline water intrusion, *Estuaries, *Mathematical models, *Computer programs, Input-output analysis, Tidal effects, Streamflow, Discharge (Water), Water levels, Forecasting, Systems analysis, Programming languages, Methodology.
Identifiers: FORTRAN programming.

A computer program is presented for the implementation of the mathematical model for the prediction of unsteady salinity intrusion in estuaries. The model is one-dimensional, although varying degrees of stratification are accounted for in the assumed longitudinal dispersion relationship. The purpose of this manual is to enable researchers and engineers to use the computer program in an effective manner without requiring that they have other than a fundamental understanding of how digital computers accept input data, execute logical and numerical instructions, and present calculations in readable form. Although a knowledge of FORTRAN programming is helpful, it is not considered necessary for the prospective user of this program. However, to avoid unnecessary computing expense, it is recommended that a user not familiar with computer applications seek the assistance of someone who is experienced when it comes to the actual execution of the computer program. (See also W73-06183 and W73-10112) (Woodard-USGS)
W73-12728

BIOGEOCHEMISTRY OF SEDIMENTS OF DELAWARE BAY,
Delaware Univ., Newark. Coll. of Marine Studies.
F. M. Swain.
Available from NTIS, Springfield, Va 22151 as COM-73-10415 Price $3.00 printed copy; $1.45 cents microfiche. DEL-SG-8-72, December 1972. 44 p, 3 fig, 20 tab, 5 ref. NOAA Sea Grant 2-35223.

Descriptors: *Sedimentology, *Bays, *Delaware River, *Biochemistry, *Geochemistry, Sediments, Chemical analysis, Sampling, Data collections, Organic matter, Ecology, Ecosystems, Benthos, Environmental effects, Dredging, Sedimentation.
Identifiers: *Delaware Bay.

Surface Holocene sediment samples from middle Delaware Bay and cored Holocene samples from lower Delaware Bay were studied for general sediment characteristics, pH, Eh, organic carbon, hydrogen, carbohydrates, amino acids, hydrocarbons, chlorophyll-derived pigments, carotenoid pigments, and humic acids. Samples from a core near Wilmington Canyon on the continental slope off Delaware Bay were analyzed for organic carbon, hydrogen, and total carbohydrates. The middle bay sediments of fine sands, silts, and clays are locally reducing and contain moderate amounts of organic residues. The middle bay is to some extent a settling area for organic matter, but a great deal of the suspended organic matter bypasses to the open sea. The lower bay sediments of sands and silty and clayey sands are possessed of a more generally oxidizing environment and contain, in most instances, less organic matter than the middle bay. The lower bay appears to be primarily a bypassing rather than a settling area for organic matter. The analytical data are tabulated. (Woodard-USGS)
W73-12739

HISTORY OF SEDIMENTATION IN MONTSWEAG BAY,
Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service.
D. Schnitker.
Maine Geological Survey Bulletin No 25 (Contribution No 43 from I.C. Darling Center, Maine University), 1972. 20 p, 19 fig, 3 ref.

Descriptors: *Estuaries, *Maine, *Sedimentation, Provenance, Tides, Sampling, Sounding, Seismic studies, Swamps, Sediment transport, Tidal waters.
Identifiers: *Montsweag Bay (Maine).

Montsweag Bay at the central Maine coast is a deeply excavated bedrock valley that has largely been filled by sediments. The deeper portions of the bedrock valley are filled by a Pleistocene blue clay which is disconformably overlain by thick Holocene sediments. Sediments were dated by radiocarbon and pollen analyses. Sedimentation rates for the last 250 years varied between 1.15 and 1.9 cm per year, increasing towards the present. These figures compare with observed sedimentation rates of 1.9 to 2.8 cm per year. The sediment accumulating in Montsweag Bay can be entirely accounted for by the influx of suspended matter with each tidal cycle through the southern entrance to the bay. Montsweag Bay is near its terminal stage of becoming a salt marsh. (Knapp-USGS)
W73-12740

FUNGI COLONIZING WOOD SUBMERGED IN THE MEDWAY ESTUARY,
Aberdeen Univ. (Scotland). School of Agriculture.
N. J. Poole, and P. C. Price.
Trans Br Mycol Soc. Vol 59, No 2, p 333-335, 1972.
Identifiers: Ceriosporopsis-halima, *Chlorinity, *Estuaries, Fagus-sylvatica, *Fungi, Nitrogen, Phoma-sp, *Scotland (Medway Estuary), Solids, Suspended solids, Wood wastes, Zalerion-maritima.

A list of fungi found to colonize beech (Fagus sylvatica) blocks placed in the upper estuary at Townsend Paper Mills, Snodland, England, and the lower estuary at H. M. Dockyard, Chatham (Scotland), is presented with data on chlorinity, N concentration as ammonium and nitrate, and suspended solids. The species lists were different, Ceriosporopsis halima, Phoma sp., and Zalerion maritima being the only species of seventeen found to occur at both stations.—Copyright 1973, Biological Abstracts, Inc.
W73-12825

COMMUNITY STRUCTURE OF THE BENTHOS IN SCOTTISH SEA-LOCHS. II. SPATIAL PATTERN,
Dunstaffnage Marine Research Lab., Oban (Scotland).
For primary bibliographic entry see Field 05C.
W73-12855

SIMULATION STUDY OF PHYTOPLANKTON PHOTOSYNTHESIS AND GROWTH IN THE FRASER RIVER ESTUARY,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 05C.
W73-12919

MERCURY DISTRIBUTION IN ESTUARINE--NEARSHORE ENVIRONMENT,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 05B.
W73-12920

THE PHYSIOGNOMY AND STRUCTURE OF THE BENTHIC MACROPHYTE COMMUNITIES ON ROCKY SHORES IN THE SOUTHWESTERN ARCHIPELAGO OF FINLAND (SEILI ISLANDS),
Turku Univ. (Finland) Dept. of Botany.
For primary bibliographic entry see Field 05A.
W73-12929

TRACE ELEMENT TRAPPING IN PTEROPOD TESTS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 05B.
W73-12937

A HYDROGRAPHIC ATLAS OF LARGER NORTH CAROLINA SOUNDS,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
A. B. Williams, G. S. Posner, W. J. Woods, and E. E. Deubler, Jr.
Available from NTIS, Springfield, Va. 22151 as COM-73-10454, Price $3.00 printed copy; $1.45 microfiche. North Carolina University Sea Grant Program Publication UNC-SG-73-02, January 1973. 130 p, 50 fig, 76 tab, 7 ref. NOAA Sea Grant 2-35178.

Descriptors: *Water temperatures, *Salinity, *Sounds, *North Carolina, Data collections, Estuaries, Coasts, Reviews, Maps, Isotherms, Sampling, Sites, Geomorphology.
Identifiers: Isohalines.

An atlas of figures, tables, and a short text provides a summary of salinity-temperature data for inland coastal waters of North Carolina in files of the University of North Carolina Institute of Marine Sciences. Mean monthly surface and bottom isohalines and isotherms are depicted in a series of 48 figures. Monthly means and extremes for salinity-temperature values are listed in tables for 76 fixed stations. During the past 75 years various portions of sounds and tidal rivers of North Carolina have been surveyed hydrographically as special interests required. Major hydrographic features and data collection sites are shown on maps. (Woodard-USGS)
W73-12948

CLASSIFICATION OF THE COASTAL ENVIRONMENTS OF THE WORLD: PART II. AFRICA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
B. Hayden, M. Vincent, D. Resio, C. Biscoe, Jr., and R. Dolan.
Available from NTIS, Springfield, Va. 22151 as AD 759-052 Price $3.00 printed copy; $1.45 microfiche. Technical Report No 3, February 1973. 46 p, 12 fig, 11 tab, 39 ref. ONR Contract Nonr-N00014-69-A-00060-0006.

Descriptors: *Coasts, *Environmental effects, *Classification, *Africa, Climates, Vegetation, Waves (Water), Shores, Geomorphology, Topography, Beaches, Littoral drift, Sands, Particle size, Beach erosion, Currents (Water), Ocean currents, Correlation analysis, Marine geology.
Identifiers: *Coastal environments.

As defined in this classification, the coastal environment has two common attributes: (1) a fluid environment consisting of both atmospheric and marine components, and (2) an interacting coastal interface system. Each attribute was classified independently prior to the integration of the components into the Classification of the Coastal Environments of the World, Part II: Africa. The atmospheric environment was treated using the methodology of air mass climatology, and the marine system was classified using water-mass analysis with modifications appropriate to nearshore conditions. The classification of shoreline interfaces was developed by detailed analysis of coastal landforms. Coastal vegetation was analyzed and distributions were compared with the physical components of the system. Close agreement was found between the biotic and physical environments, which served to verify the methodology employed. The existence of both north-south and east-west hemispheric symmetry at all levels accounts for the high degree of internal coupling among the processes operative within the coastal zone. The similarities and differences between the coastal environments of Africa and those found in the earlier study of the Americas are discussed and causal factors explored. (Woodard-USGS)
W73-12950

MARICULTURE IN ESTUARINE OIL--PIPELINE CANALS IN LOUISIANA,
Nicholls State Univ., Thibodaux, La. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W73-12951

STANDING CROPS OF NATURAL FISH POPULATIONS IN BRACKISH-WATER OIL FIELD PIPELINE CANALS,
Nicholls State Univ., Thibodaux, La. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W73-12952

INVESTIGATION OF THE NATURE, EXTENT AND FATE OF NATURAL OIL SEEPAGE OFF SOUTHERN CALIFORNIA,
California Univ., Santa Barbara.
For primary bibliographic entry see Field 05B.
W73-12958

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

HIGH-PURITY DISTILLED WATER PRODUCING APPARATUS,
Toshin Industrial Machine Co. Ltd., Osaka (Japan). (assignee)
S. Miyamoto.
U. S. Patent No. 3,736,234, 6 p, 7 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1665, May 29, 1973.

Descriptors: *Patents, *Distillation, *Water purification, *Water treatment, Equipment, *Condensation, Vapor, Evaporation.

The apparatus comprises a mist separator mounted in a steam generator, and a tubular section for introducing steam into a condenser. The upper portion of the tube is adapted to heat exchange steam with liquid condensed at substantially high temperature and collected near the upper portion. There is at least one liquid receiving section arranged within the condenser for receiving a required amount of the liquid and at least one gas removing container in which occluded gas is continuously evacuated by gas aspiration. (Sinha-OEIS)
W73-12450

HEAT-EXCHANGER FOR DESALTING SEA WATER,
Societa Italiana Resine S.P.A., Milan (Italy). (assignee)
D. Barba, G. Liuzzo, G. Tagliaferri, and A. Germana.

U.S. Patent No. 3,735,808, 3 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1562, May 29, 1973.

Descriptors: *Patents, *Desalination apparatus, *Sea water, Saline water, Equipment, *Heat exchangers, Evaporation, *Condensation, Potable water, Water treatment.

The object is an improvement relating to instantaneous multiple expansion evaporators. A nest of tubes is rendered rigid with a hollow cylinder which is passed through a single hole provided in the separating baffle so that a high degree of tightness is achieved between the cylinder and the hole. Each tube of the nest is located in apertures predisposed in the circular walls of the cylinder, and therefore rendered rigid with the cylinder itself. Sea water is preheated before being introduced into the chambers by causing it to pass as cooling liquid through heat-exchanger tubes. The vapor formed condenses on nests of heat exchanger tubes which longitudinally traverse the entire length of the evaporator and the condensate is collected so that it cannot come in contact with the saline solution. (Sinha-OEIS)
W73-12453

ION EXCHANGE COLOR AND MINERAL REMOVAL FROM KRAFT BLEACH WASTES,
Montana State Univ., Bozeman. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-12522

3B. Water Yield Improvement

A COMPARISON OF RATES OF WATER LOSS THROUGH TRANSPIRATION OF SEVERAL SOUTHERN NEW MEXICO PHREATOPHYTE SPECIES,
New Mexico State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 02D.
W73-12497

THE INTERRELATIONSHIPS OF THE VEGETATION CHARACTERS OF FOUR SALT DESERT SHRUB ASSOCIATIONS OF COLORADO PLATEAU,
Pakistan Forest Inst., Peshawar.
K. M. Ibrahim, and D. L. Goodwin.
Pakistan Journal of Forestry, Vol 21, No 2, p 121-132, April 1971. 5 tab, 11 refs.

Descriptors: *Desert plants, *Correlation analysis, *Shrubs, Colorado, Plant populations, Range grasses, Arid lands, Range management, Watershed management, Planning, Livestock, Sediments, Reclamation, Colorado River.
Identifiers: *Colorado Plateau, *Saltbush.

In planning range and watershed management of the Colorado Plateau region, four distinct salt desert shrub associations were identified and studied: Atriplex confertifolia -- Hilaria jamesii; Atriplex nuttallii var. nuttallii; Atriplex nuttallii var. gardneri -- Aster xylorrhiza; and Atriplex corrugata. Simple correlation coefficients, used to show the interrelationships between the vegetation characters of the plant communities, indicate: (1) In the Atriplex confertifolia -- Hilaria jamesii association, an increase in shrub cover might reduce the perennial grass cover; (2) in the Atriplex nuttallii var. nuttallii -- Hilaria jamesii association, an increase of shrub cover probably will reduce the cover of perennial grasses and annuals; (3) in the Atriplex nuttallii var. gardneri -- Aster xylorrhiza association, the presence of shrubs may decrease the cover of annuals; and (4) in the Atriplex corrugata association, an increase of shrub cover would affect adversely the cover of perennial grasses, annuals, and cryptogams. The study is of particular importance for this arid region, not only because this is a major wintering area for livestock, but also because the Colorado Plateau region produces considerable unwanted sediment which affects reclamation developments on the Colorado River. (Gloyd-Arizona)
W73-12791

SOME EFFECTS OF EVAPORATION SUPPRESSION ON RESERVOIR ECOLOGY,
North Texas State Univ., Denton. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W73-12869

3C. Use of Water of Impaired Quality

MINERAL POLLUTION IN THE COLORADO RIVER BASIN,
Environmental Protection Agency, Phoenix, Ariz. Colorado River Basin Water Quality Control Project.
For primary bibliographic entry see Field 05B.
W73-12715

LEACHING SALTY SOILS,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 02G.
W73-12789

SODIUM RELATIONS IN DESERT PLANTS: 1. CATION CONTENTS OF SOME PLANT SPECIES FROM THE MOJAVE AND GREAT BASIN DESERTS,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 02I.
W73-12792

SODIUM RELATIONS IN DESERT PLANTS: 2. DISTRIBUTION OF CATIONS IN PLANT PARTS OF THREE DIFFERENT SPECIES OF ATRIPLEX,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 02I.
W73-12793

EFFECT OF QUALITY OF WELL WATERS ON THE GERMINATION AND MINERAL COMPOSITION OF WHEAT ON SALINE-SODIC SOILS RICH IN MAGNESIUM,
Banaras Hindu Univ., Varanasi (India). Dept. of Soil Science and Agricultural Chemistry.
S. Singh, and R. S. Singh.
J Indian Soc Soil Sci. Vol 19, No 4, p 383-388. 1971.
Identifiers: Germination, *India (Bihar), *Magnesium, Minerals, *Saline sodic soils, *Wheat-M, Well water.

Some important characteristics of salt-affected well waters and their impact on the germination and chemical composition of wheat on saline-sodic soils rich in Mg in south western tracts of Bihar were studied. Most of the well waters contain more soluble Mg than Ca. The concentration of Na, CO3 and HCO3 is also very high. The characteristics of well waters like electrical conductivity, Na adsorption ratio, soluble Na percentage, and residual Na carbonate are significantly correlated (negatively) with germination percentage. The correlation between soluble Ca percentage and germination percentage is positively correlated. Positive correlations exist between soluble Na percentage of water and Na of plants. Na+Mg/Ca of irrigation water is positively (significantly) correlated with Na and Mg. A prediction value (Na+Mg/Ca) has been evolved for judging the quality of well waters on the basis of adverse effect of Na and Mg and favorable effect of Ca on the germination. The predicted value is highly correlated (negatively) with germination percentage.--Copyright 1972, Biological Abstracts, Inc.
W73-12809

MORPHOLOGY, GENESIS, OCCURRENCE AND AGRICULTURAL POTENTIAL OF ACID SULPHATE SOILS IN CENTRAL THAILAND,
Food and Agriculture Organization of the United Nations, Bangkok (Thailand). Soil Survey Land Classification Project.
For primary bibliographic entry see Field 02G.
W73-12818

3D. Conservation in Domestic and Municipal Use

SYSTEMS APPROACH TO METROPOLITAN AND REGIONAL AREA WATER AND SEWER PLANNING,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 06A.
W73-12351

IDENTIFICATION OF WATER RESOURCES PLANNING PROBLEMS IN THE METROPOLITAN AREA OF GREATER SAN ANTONIO AND ITS ASSOCIATED COUNTIES,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 06B.
W73-12354

ANNUAL REPORT OF THE NEW YORK STATE URBAN DEVELOPMENT CORPORATION, 1972.
New York State Urban Development Corp., New York.

1972. 112 P, 16 FIG, PHOTO, 11 TAB.

Descriptors: *Floods, *Flood damage, *Urban renewal, *Chemung River, Planning, Flood control, Flood protection, *New York.
Identifiers: *Urban Development Corporation, *Hurricane Agnes, Chemung Valley, Temporary housing, Housing, Elmira (New York), Corning (New York).

The Urban Development Corporation, a state agency created by the New York legislature in 1968 to develop and finance low and middle income housing, to assist industrial and commercial development, and to help provide various civic facilities, works closely with local officials and citizen groups and attempts to be a catalyst for private development. The UDC's programs for 1972 are described. UDC response to the worst flooding in history in the Chemung Valley in late June, 1972, largely as a result of Hurricane Agnes, is discussed. Flood waters crested 12 feet higher than the protective dikes and levees and the cities of Elmira and Corning plus several small towns were devastated. Flood control measures are being studied to avoid reoccurrences of '72 disasters. Raising of dikes, dredging of Chemung River and construction of two Pennsylvania upstream dams is expected to substantially safeguard the entire Valley from future major flooding. The UDC played a key role in the federal mobile home program for temporary housing and immediately began working with the communities on urban renewal plans and programs. The urgency of the situation and the ability of UDC to act quickly have resulted in several completed plans and construction starts. (Elfers - North Carolina)
W73-12356

REGIONAL SEWER SYSTEM, PLANNING AND COST ESTIMATION MODEL,
Regional Planning Council, Baltimore, Md.
For primary bibliographic entry see Field 05G.
W73-12357

COMPREHENSIVE PUBLIC WATER SUPPLY STUDY FOR SCHENECTADY COUNTY, NEW YORK.
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.

Prepared for the Schenectady County Board of Representatives. Summary report. March 1970. 18 p, 3 maps, 7 tab. N.Y. State Dept. of Health CPWS-56.

Descriptors: *Water supply, *Planning, Administration, Financing, Water demands, Water rates, *New York, *City planning.
Identifiers: *Schenectady (New York), Water supply system expansion, Systems consolidation.

Since Schenectady County has adequate water supplies for the near future, planning is discussed for the orderly development and distribution of these supplies including the expansion and consolidation of existing systems to meet new demands efficiently. Focusing on the Schenectady Metropolitan Area and the Delanson-Duanesburg area, the study includes projections of population and water demands, inventories of existing systems and available water supply sources, examination of local water quality problems, and analyses of alternative development and expansion plans. It is recommended that all the public water systems in the Schenectady area be consolidated into a single system and that immediate steps be taken to increase and improve local supplies in the Delanson-Duanesburg areas. A proposed financing plan, including a new water rate schedule, and a plan for implementation, are outlined. (Elfers - North Carolina)
W73-12358

SUMMARY REPORT: COMPREHENSIVE SEWERAGE STUDY FOR SCHENECTADY COUNTY, NEW YORK.
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
For primary bibliographic entry see Field 05G.
W73-12359

OUTDOOR RECREATION IN THE BALTIMORE AREA.
Regional Planning Council, Baltimore, Md.
For primary bibliographic entry see Field 06D.
W73-12360

AN EVALUATION OF BALTIMORE HARBOR LAND USE POTENTIALS,
Regional Planning Council, Baltimore, Md.
For primary bibliographic entry see Field 06B.
W73-12361

INTERIM AREAWIDE WATER AND SEWER PLAN: BEL-O-MAR AREA.
Candeub, Fleissig and Associates, Newark, N.J.
For primary bibliographic entry see Field 05G.
W73-12362

SURVEY OF WATER TRANSPORTATION POTENTIAL TO REDUCE CONGESTION AND POLLUTION IN WASHINGTON, D.C. AND OTHER MAJOR CITIES.
Lulejian and Associates, Inc., Falls Church, Va.
For primary bibliographic entry see Field 05G.
W73-12363

KAY COUNTY, OKLAHOMA, WATER AND SEWERAGE COMPREHENSIVE PLAN.
Evans and Nelson Engineering Co. and Associates, Ponca City, Okla.
For primary bibliographic entry see Field 05G.
W73-12364

FUNCTIONAL WATER AND SEWERAGE PLAN AND PROGRAM, PEE DEE REGION, SOUTH CAROLINA.
LBC and W Associates, Columbia, S.C.
For primary bibliographic entry see Field 05G.
W73-12365

TOWN OF CAIRO WASTE WATER REPORT.
Diachishn (A.) and Associates, New York.
For primary bibliographic entry see Field 05D.
W73-12366

THE LAKEFRONT PLAN OF CHICAGO.
Chicago, Ill.
For primary bibliographic entry see Field 04C.
W73-12367

REGIONAL UTILITIES STUDY: DRAINAGE VOLUME OF TECHNICAL APPENDIX.
Minges (James S.) and Associates, Inc., Farmington, Conn.
For primary bibliographic entry see Field 04A.
W73-12368

REGIONAL UTILITIES STUDY: SEWERAGE VOLUME OF TECHNICAL APPENDIX.
Minges (James S.) and Associates, Inc., Farmington, Conn.
For primary bibliographic entry see Field 05D.
W73-12369

COORDINATION OF AGRICULTURAL AND URBAN WATER QUALITY MANAGEMENT IN THE UTAH LAKE DRAINAGE AREA,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 05G.
W73-12508

MATHEMATICAL MODELING OF WATER MANAGEMENT STRATEGIES IN URBANIZING RIVER BASINS,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 05G.
W73-12509

EVALUATION OF URBAN WATER MANAGEMENT POLICIES IN THE DENVER METROPOLITAN AREA,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 05G.
W73-12510

STREAM QUALITY PRESERVATION THROUGH PLANNED URBAN DEVELOPMENT,
Regional Science Research Inst., Philadelphia, Pa.
For primary bibliographic entry see Field 05G.
W73-12518

3E. Conservation in Industry

METHODS FOR THE FURTHER IMPROVEMENT OF SPENT LIQUOR RECOVERY IN LENZING,
Lenzinger Zellulose- und Papierfabrik A.G. (Austria).
For primary bibliographic entry see Field 05D.
W73-12524

ENVIRONMENTAL CARE AT PULP MILLS, RESULTS AND EXPECTATIONS,
National Swedish Environment Protection Board, Stockholm. Environmental Care Project.
For primary bibliographic entry see Field 05D.
W73-12545

VOLATILE BIOCHEMICAL OXYGEN-CONSUMING MATERIALS OCCURRING IN THE SULFITE PROCESS WITH LIQUOR NEUTRALIZATION AND CONDENSATE RECOVERY: THEORETICAL STUDY, (FLYKTIGA BIOKEMISK SYREFORBRUKANDE AMNENS UPPTRADANDE I SULFITPROCESSEN VID LUTNEUTRALISERING OCH KONDENSATATERFORING, TEORETISK UNDERSOKNING),
Angpanneforeningen, Stockholm (Sweden).
For primary bibliographic entry see Field 05D.
W73-12546

ADVANCED POLLUTION ABATEMENT TECHNOLOGY IN THE PULP AND PAPER INDUSTRY.
Organization for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 05D.
W73-12552

ENVIRONMENTAL COST OF MINING,
Bureau of Mines, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-12687

EXTERNALITIES, WELFARE, AND THE FEASIBILITY OF CORRECTIVE TAXES,
State Univ. of New York, Stony Brook.
For primary bibliographic entry see Field 06B.
W73-12694

A STUDY OF THE ECONOMIC IMPACT ON THE STEEL INDUSTRY OF THE COSTS OF MEETING FEDERAL AIR AND WATER POLLUTION ABATEMENT REQUIREMENTS. PART I - EXECUTIVE SUMMARY.
For primary bibliographic entry see Field 05G.
W73-12707

IMPACT OF COSTS ASSOCIATED WITH NEW ENVIRONMENTAL STANDARDS UPON THE PETROLEUM REFINING INDUSTRY. PART I. THE IMPACT OF ENVIRONMENTAL CONTROL COSTS.
Sobotka (Stephen) and Co., New York.
For primary bibliographic entry see Field 05G.
W73-12708

A DESCRIPTIVE ANALYSIS OF THE BAKERY PRODUCTS INDUSTRY DETAILING INDUSTRY TRENDS AND CHARACTERISTICS RELEVANT TO ECONOMIC IMPACT ANALYSIS OF ENVIRONMENTAL STANDARDS. PART II.
Ernst and Ernst, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-12709

A STUDY OF THE IMPACT OF POLLUTION STANDARDS AND CHARGES ON THE BAKERY INDUSTRY. PART III.
Ernst and Ernst, Washington D.C.
For primary bibliographic entry see Field 05G.
W73-12710

PETROLEUM...40 YEARS OF RESEARCH,
Secony Mobil Oil Co., Inc., New York.
D. H. Clewell.

Industrial Water Engineering, Vol 3, No 1, p 20, 21, 61, 62, January 1966.

Descriptors: *Pollution, Waste water disposal, *Waste water treatment, *Oil industry, Education, Professional societies, Universities, Recycling.

The petroleum industry has been working on various phases of water conservation for nearly 40 years. In 1927 after an American Petroleum Institute (API) study indicated the growing seriousness of public water supply pollution, the Institute formed a committee to collect, develop, and publish needed technical information on the disposal of refinery wastes. Over the intervening years the API has sponsored many research projects at universities and independent research institutions; several of the current projects are discussed. Most water pollution problems can be traced to society's expanding wants and needs and no segment can be singled out as the source of pollution problems, therefore water problems must be solved in a spirit of cooperation. (Campbell-NWWA)
W73-12768

AN INDUSTRIAL POINT OF VIEW-1970,
Wisconsin Electric Power Co., Milwaukee.
For primary bibliographic entry see Field 06B.
W73-12965

3F. Conservation in Agriculture

AQUEOUS IRON-SULFUR SYSTEMS IN RICE FIELD SOILS OF LOUISIANA,
Alabama Univ., Birmingham. Inst. of Dental Research.
G. Pitts, A. I. Allam, and J. P. Hollis.
Plant Soil. Vol 36, No 2, p 251-260. 1972. Illus.
Identifiers: Aqueous solutions, *Louisiana, *Rice-M fields, Soils, Sulfur, *Iron-sulfur solutions.

A phase diagram of an aqueous Fe-S system constructed from thermodynamic data for initial concentrations of 100 ppm H2S and 100 ppm Fe permitted the prediction that the principal precipitate found in the Eh-pH range of flooded Louisiana rice paddies would be FeS2. Analysis of precipitates formed in the laboratory at Eh and pH levels simulating paddy conditions showed that both FeS2 and FeS were present; however, more FeS than predicted was actually precipitated in the FeS2 field by dominance. A multiparameter diagram for an aqueous system was constructed relating equilibrium Fe concentration, Eh, pH and the equilibrium H2S concentration (that H2S which is in equilibrium with precipitated sulfides). It was demonstrated from the diagram and associated thermo-dynamic equations that the H2S±FeS2 equilibrium predicts theoretical values of H2S in agreement with experimental values of H2S from rice paddy soil samples.--Copyright 1972, Biological Abstracts, Inc.
W73-12385

CONSUMPTIVE USE OF WATER BY DWARF WHEAT IN UDAIPUR VALLEY,
Udaipur Univ. (India). Coll. of Agriculture.
S. P. Srivastava.
Indian J Agric Sci. Vol 42, No 2, p 152-155. 1972.
Identifiers: Ammonium, *Consumptive use, Evapotranspiration, India (Udaipur Valley), Nitrates, Sulfates, Transpiration, Triticum-Aestivum, Water utilization, *Wheat (Dwarf).

An irrigation-and-manurial trial with wheat (Triticum aestivum L.) cultivar 'S 227' was conducted on mixed black soil. The mean total consumptive use was 395 and 519 ha-mm, corresponding to 30 and 60% available soil moisture regime. The mean daily consumptive use was 0.6 ha-mm up to the first irrigation; thereafter, it increased by about 5 times. The evapotranspiration was also estimated from meteorological data through empirical formulae. Application of half of the N at sowing and the remaining half at crown-root-initiation stage proved better. Ammonium sulfate nitrate seemed to be a promising form of N.--Copyright 1973, Biological Abstracts, Inc.
W73-12387

A PILOT FISH-POND SYSTEM FOR UTILIZATION OF SEWAGE EFFLUENTS, HUMBOLDT BAY, NORTHERN CALIFORNIA,
California State Univ., Humboldt, Arcata.
For primary bibliographic entry see Field 05D.
W73-12434

FIELD LEACHING BY SPRINKLER AND SURFACE IRRIGATION DURING A CROP SEASON,
Agricultural Research Service, Brawley, Calif.
L. F. Hermsmeier, and M. T. Kaddah.
Paper 72-723, 1972 Winter Meet Am Soc Agric Eng, Chicago, Illinois, Dec 1972. 20 p, 4 fig, 3 tab.

Descriptors: *Leaching, *Irrigation, *Sprinkler irrigation, *Surface irrigation, *Salt balance, Drainage, Irrigation effects, Application methods, Subsurface drainage, Soil management, Irrigation efficiency, Crop production, Barley, Salinity, Saline soils, *California, On-site tests, Land reclamation, Rates of Application.
Identifiers: *Imperial Valley (Calif.), Salt removal.

Several major disadvantages of leaching a field by ponding water led to considering sprinklers as an alternative. Laboratory tests indicated that leaching by sprinkler irrigation may not only provide more efficient water use, but also save time, since when soil is not saturated, simultaneous leaching and crop production can occur. In Imperial Valley, California, a field experiment was conducted to determine: (1) the relative leaching effectiveness of sprinkling and surface irrigation on barley, and (2) effects of ponding on crop growth and yield. Results of leaching during 2 barley growing seasons indicated that applying excess irrigation water to a winter barley crop can effectively leach salt from the soil, while obtaining high crop yield. Salt removal improved slightly between drains in the top foot of soil when sprinklers were used, but no improvement was noted at a depth of 5 ft. Surface irrigation resulted in increased leaching and gave higher barley yields than sprinkler irrigation. Application of up to 30% excess water with surface irrigation and 67% excess water with sprinklers did not adversely affect yields. (USBR).
W73-12464

GENERALIZED DISCHARGE RELATIONS FOR CUTTHROAT FLUMES,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 08B.
W73-12474

ELECTROSTATIC CROP SPRAYING,
Hong Kong Univ.
R. Coffee.
New Scientist, Vol 57, No 830, p 194-196, Jan 25, 1973. 2 fig, 1 photo.

Descriptors: *Pesticides, Pesticide drift, *Spraying, Pest control, Insect control, Environmental effects, Electric fields, Insecticides, Biology, Foreign research, Agricultural chemicals, Agriculture, Crops, Application methods, Pesticide kinetics, Agronomy, Water pollution control.
Identifiers: Spray losses, Hong Kong, Experimentation, *Charged particles, *Dusting, Electrostatic precipitation, *Electrostatics.

Investigations to improve methods of pesticide deposition, reduce the volume of pesticide applied, and lessen the drift problem are reported. One method described uses powerful electrostatic forces to propel and direct pesticide particles onto crop foliage, with a resulting increase in material efficiency, distribution, and retentivity. The basic principles of electrostatic deposition are not complicated. Particles to be deposited are given a unipolar charge as they leave of the vegetation being sprayed. Investigations reveal that even the underside of the leaves is covered with the pesticide. This technique may help solve the pollution problem by enabling more economical material to be used and by introducing a powerful magnetic settling field. The Electrical Engineering Department of Hong Kong University is studying the fundamentals of electrostatic crop spraying and developing 2 promising spraying devices. (USBR)
W73-12482

IMPROVEMENTS IN MOVING SPRINKLER IRRIGATION SYSTEMS FOR CONSERVATION OF WATER,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
D. L. Miles.
Available from the National Technical Information Service as PB-222 267, $3.00 in paper copy, $1.45 in microfiche. Colorado Environmental Resources Center Completion Report Series No. 49, June 1973. 153 p, 41 fig, 12 tab, 53 ref. OWRR-B-039-COLO (7). 14-31-0001-3064.

Descriptors: *Sprinkler irrigation, *Infiltration, *Irrigation systems, Irrigation design, Irrigation practices, Infiltration rates, Mathematical models, *Infiltrometers, Soil surfaces.
Identifiers: *Center-pivot sprinkler.

Self-propelled center-pivot sprinkler systems have become very popular because of their low labor requirements and ability to economically irrigate rolling sandhills. This equipment applies water uniformly to the soil surface, but the water application rates greatly exceed the infiltration capability of most soils causing water to move on the soil surface from local high areas and slopes to nearby low spots. The resulting nonuniformity of irrigation results in reduced crop yields, waste of water, and fertilizer leaching. This problem was investigated using a laboratory infiltrometer, a mathematical model, a field sprinkler infiltrometer, and field investigations under operating systems. Recommendations were developed to reduce of eliminate the problem through improved system design, special field preparation and farming techniques, and improved operating procedures.
W73-12507

COORDINATION OF AGRICULTURAL AND URBAN WATER QUALITY MANAGEMENT IN THE UTAH LAKE DRAINAGE AREA,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 05G.
W73-12508

MATHEMATICAL MODELING OF WATER MANAGEMENT STRATEGIES IN URBANIZING RIVER BASINS,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 05G.
W73-12509

INFLUENCE OF DIFFERENT MOISTURE REGIMES AND METHODS OF PHOSPHATE APPLICATION ON GROWTH AND NUTRIENT ABSORPTION BY WHEAT (TRITICUM AESTIVUM L.),
Jawaharlal Nehru Agricultural Univ., Jabalpur (India).
R. B. Sharma, G. P. Verma, and S. S. Khanna.
Indian J Agric Sci. Vol 42, No 1, p 52-56. 1972.

Identifiers: *Nutrient absorption (Plants), *Phosphates, TriticumaAestivum, *Wheat growth, Soil moisture.

The total dry matter and grain yield significantly increased with an increase in the level of soil moisture and by subsurface phosphate placement. However, the interaction between moisture levels and P placement was not significant. A decrease in the supply of soil moisture increased the N and K in the grain but decreased them in the straw. The concentration of P in the grain and straw decreased with a decrease in moisture supply. The placement of P had hardly any definite effect on the concentration of N and K in the grain and straw, but there was an increase in the concentration of P, though it was not statistically significant.--Copyright 1973, Biological Abstracts, Inc.
W73-12539

EFFECT OF VARYING WATER MANAGEMENT PRACTICES ON THE GROWTH, YIELD AND NITROGEN UPTAKE BY HIGH-YIELDING RICE VARIETIES,
Indian Agricultural Research Inst., New Delhi. Div. of Biochemistry.
J. E. Shinde, and V. K. Srivastava.
Indian J Agric Sci. Vol 42, No 1, p 57-62. 1972.
Identifiers: Cultivars, Plant growth, *Nitrogen fertilization, Oryza-Sativa, *Rice, Uptake, Water uptake, Yield, Water management (Applied).

The pot-culture experiment with rice (Oryza sativa L.) cv. 'IR 8' and cv. 'Padma' included waterlogging and upland conditions imposed during different growth stages of the plant. The effects of varying water management practices were fully expressed only when the plants were adequately fertilized with N. The highest grain yield and N uptake by the panicle was obtained in 'IR 8' and 'Padma' when waterlogging continued from transplanting to flowering and maximum tillering, respectively. Upland conditions imposed during any growth stage, except ripening, adversely affected the grain yield of 'IR 8', but 'Padma' withstood them better.--Copyright 1973, Biological Abstracts, Inc.
W73-12583

NUTRIENTS IN NEBRASKA'S WATERS,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W73-12615

EFFECTS OF VARIOUS SOIL MOISTURE REGIMES AND DIFFERENT LEVELS OF NITROGEN AND DIFFERENT SPACINGS OF THE QUALITY OF POTATO TUBERS (SOLANUM TUBEROSUM L.),
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
R. S. Narang, and S. S. Kanwal.
J Res Punjab Agric Univ. Vol 8, No 4, p 432-436. 1971.
Identifiers: *Nitrogen, *Potato tubers, Protein, Soils, Solanum-Tuberosum, Spacings, Starch,Tubers, *Soil moisture.

The protein content in tubers increased with each level of available soil moisture (ASM) up to 20% ASM or N (up to 180 kg N/ha), whereas the starch content showed a reverse trend. The variation in spacing from 40 cm x 20 cm to 60 cm x 20 cm did not show any significant influence on either of these 2 quality characteristics. An inverse relationship was observed between the percentage of protein and starch contents of the tubers. The per hectare starch yield, however, was the highest at the highest level of N (180 kg N/ha), as well as at the highest available soil moisture regime (80%). This was because of the overall increased yield of tubers under these treatments. The treatment differences, however, were statistically non-significant.--Copyright 1973,Biological Abstracts, Inc.
W73-12640

THE QUALITY OF DRAINAGE WATER FROM IRRIGATED BLACK COTTON SOILS FOR IRRIGATION,
University of Agricultural Sciences, Siruguppa (India). Agricultural Research Station.
T. G. Bhadrapur, and T. Rao.
Mysore J Agric Sci. Vol 6, No 1, p 28-33. 1972.
Identifiers: Alkalinity, *Drainage water, Evaporation, *Irrigation, Salinity, Soils, Summer, Transpiration, Seepage, *Black cotton soils.

The Thungabhadra Project canal, its drainage and seepage waters were analyzed periodically for 1 yr to assess their suitability for irrigation. Both waters had high salt levels insummer months, seepage water is used for heavy irrigation with adequate drainage facilities; otherwise there is risk from both salinity and alkalinity hazards.--Copyright 1973, Biological Abstracts, Inc.
W73-12650

VARIABILITY OF RAINFALL AND AGRICULTURAL EFFICIENCY OF SHOLAPUR DISTRICT,
Sholapur Coll. (India). Dept. of Geography.
T. P. Patil.
J Shivaji Univ. Vol 4, No 7/8, p 101-107. 1971. Illus.
Identifiers: Agriculture, *India (Sholapur), Jowar, *Rainfall.

District Sholapur a semiarid part of Maharashtra receives scanty and varying amount of rainfall. Year round high temperature accounts for high water deficiency. Irrigation is insignificant, hence almost all crops are rainfed. Rains early, late and widely distributed result in changing crop pattern and acreage. Mean annual rainfall figures do not reflect the reliability of rainfall at a place, because they represent the mean of widely scattered figures on either side of the mean. Reliability is tested by coefficient of variability. A sound correlation exists between variability of rainfall and variability of gross cropped acreage. Similar relation is likely to exist between variability of rainfall and 'Rubi' jowar acreage.--Copyright 1973, Biological Abstracts, Inc.
W73-12659

EFFECT OF COMPACTION ON YIELD AND UPTAKE OF N, P AND K BY MAIZE (ZEA MAYS L.),
Jawaharlal Nehru Agricultural Univ., Jabalpur (India).
G. P. Verma, and R. B. Sharma.
JNKVV (Jawaharlal Nehru Krishi Vishwa Vidyalaya) Res J. Vol 6, No 1, p 16-20. 1972. Illus.
Identifiers: Bulk, Compaction, Density, *Maize, *Nitrogen, *Phosphorous, *Potassium, Yield, Zea-Mays.

Studies were conducted on 4 soil series of Malwa Plateau, Malwa Plateau, Madhya Pradesh. In the Kheri series, loosening the soil to a bulk density was useful whereas compaction considerably reduced the growth and absorption of nutrients. For the Kamaliakheri and Runija soil series, the natural bulk density was the optimum for maize whereas for the Unhel soil series, compaction of the soil to a bulk density of 1.40 g cm-3 increased the growth and absorption of nutrients. The compaction of soil to create a bulk density > 1.40 g cm-3 proved harmful for plant growth in all soil series. The harmful effect of compaction seemed to be due to reduction in the absorption of nutrients.--Copyright 1973, Biological Abstracts, Inc.
W73-12660

ANNUAL WATER BALANCE AND AGRICULTURAL DEVELOPMENT IN ALASKA,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
J. E. Newman, and C. I. Branton.
Ecology. Vol 53, No 3, p 513-519. 1972. Illus.
Identifiers: Agricultural development, *Alaska, Annual, *Crop production.

Mean annual precipitation in Alaska varies from 10 cm in the north to well over 500 cm in the southeast. Much of the interior has a macro-scale negative mean water balance, whereas coastal areas are very humid. Most land areas with the potential for agricultural development lie along the major interior river valleys. Nearly all of these land areas have long-term negative water balances. Should agricultural development take place in these areas, this negative water balance is likely to be magnified. Only those potential agricultural lands in the Kenai Peninsula, Kodiak-Aleutian Island chain, and the southeast coastal regions lack water limitations when subjected to intensive crop production.--Copyright 1973, Biological Abstracts, Inc.
W73-12664

SOIL NITROGEN BALANCE IN SELECTED ROW-CROP SITES IN SOUTHERN CALIFORNIA,
California Univ., Riverside. Dept. of Soil Science.
D. C. Adriano, F. H. Takatori, P. F. Pratt, and O. A. Lorenz.
J Environ Qual. Vol 1, No 3, p 279-283. 1972. Illus.
Identifiers: *California, Crop sites, Denitrification, Drainage, *Fertilization, Irrigation, Nitrate, *Nitrogen, Soils, Row crops.

Nine row-crop sites, where data for N fertilizer use, crop yields, and amounts of irrigation water used were available for a number of years, were studied to estimate the N balance as related to NO3- in water in the unsaturated zone from below the zone of root influence to the water table or to the 15-m depth. The system of predicting NO3- concentrations in drainage waters based on the difference between N inputs and N removal in harvested crops and the drainage volume in which the excess N, converted to NO3-, is dissolved, was valid in open-porous soils containing no layers that restrict water movement within the soil profile (0- to 2-m depth). A combination of losses plus net immobilization of up to 56% had to be assumed in some soils to account for all the N loss. In 2 soils that had been used for disposal of feedlot manure, net mineralization of N from the organic N pool had to be assumed to explain the data obtained. The current fertilization and irrigation practices used for some row crops in southern California leave varying amounts of NO3- in the drainage water. The amounts depend on the total N added, crop removal, drainage volume, net mineralization and losses.--Copyright 1973, Biological Abstracts, Inc.
W73-12670

ECONOMICS IN SOIL AND WATER CONSERVATION,
Iowa State Univ., Ames. Dept. of Economics.
J. F. Timmons.
Iowa Agriculture and Home Economics Experiment Station, Ames, Journal Paper No. J-6470, 1972. 3 p. OWRR A-036-IA (6).

Descriptors: *Soil conservation, *Water conservation, *Economic efficiency, Project planning, Decision making, Productivity, Benefits.
Identifiers: Marginal analysis, Multipurpose activities, Externalities.

Protection of the soil and water resource base to maintain high agricultural productivity requires selection of type and amount of public resources to be used for resource management and investment and choice of soil and water practices on the basis of cost-benefit criteria. Using simple graphical analysis a method is illustrated for determining the amount of investment required to maintain a chosen productivity level and the success of past conservation investments. Selection of conservation practices should be based upon marginal analysis. It is important that this same analysis be applied to the selection of a multipurpose activity. Thus, investments in each of the various purposes will be determined to maximize the return to each

purpose. Despite the economic logic behind the use of marginal analysis in investment decisions, Federal flood control legislation requires only that benefits exceed costs. Watershed, basin and district organizations attempt to internalize the externalities associated with conservation practices. (Weaver-Wisconsin)
W73-12691

PUBLIC SUPPORT OF PRIVATE WATER RESOURCE DEVELOPMENT IN AGRICULTURE--WITH IMPLICATIONS FOR FIRM GROWTH,
Wyoming Agricultural Experiment Station, Laramie.
For primary bibliographic entry see Field 04B.
W73-12698

COST CURVES FOR CROSS-DRAINAGE WORKS,
Government Coll. of Engineering, Aurangabad (India).
For primary bibliographic entry see Field 04A.
W73-12704

HYDROPHYSICAL PROPERTIES AND WATER REGIME OF CRIMEAN SOUTHERN CHERNOZEMS IN A FIELD CROP ROTATION (VODNO-FIZICHESKIYE SVOYSTVA I VODNYY REZHIM YUZHNYKH CHERNOZEMOV KRYMA V POLEVOM SEVOOBOROTE),
Krymskii Selskokhozyaistvennyi Institut, Simferopol (USSR).
For primary bibliographic entry see Field 02G.
W73-12744

WATER REGIME IN A CROP ROTATION ON CHERNOZEM SOILS IN SOUTHEAST RUSSIA (VODNYY REZHIM V SEVOOBOROTE NA CHERNOZEMNYKH POCHVAKH YUGO--VOSTOKA),
For primary bibliographic entry see Field 02G.
W73-12747

WATER METABOLISM IN DESERT SHEEP, EFFECTS OF VARIOUS DEGREES OF WATER RESTRICTION ON THE DISTRIBUTION OF BODY WATER IN MARIWARI SHEEP,
Central Arid Zone Research Inst., Jodhpur (India). Div. of Animal Studies.
F. R. Purohit, P. K. Ghosh, and G. C. Taneja.
Australian Journal of Agricultural Research, Vol 23, No 4, p 685-691, July 1972. 2 fig, 3 tab, 15 ref.

Descriptors: *Animal metabolisms, *Water requirements, *Dehydration, *Animal physiology, *Drought tolerance, Sheep, Arid lands, Deserts, Livestock, Water shortage, Water utilization, Drought resistance, Adaptation, Weight.
Identifiers: *India (Rajasthan), Water deprivation, Body fluids, Mariwari breed.

The most crucial limiting factor for the survival of livestock in the arid and semiarid tracts of western Rajasthan in northwest India is the chronic scarcity of drinking water. During critical periods many stock growers try to save their flocks by transhumance, but mostly the animals must depend on their physiological ability to withstand water deprivation. Effects of various degrees of water restriction on the distribution of body water in Mariwari sheep, one of the hardiest breeds in the Rajasthan desert, are discussed. These sheep are able to withstand a dehydration loss of about 18 percent in body weight, evidence that they are reasonably well adapted to water deprivation. When the water intake was reduced below 75 percent of the normal daily requirement, the total body water, total blood and plasma values, and the extracellular, intracellular, and interstitial fluid volumes of the sheep began to decrease. A reduction to 25 percent normal intake was similar in its effect to complete deprivation, with plasma volume falling by 43 percent and the extracellular fluid volume by 33 percent. However, the animals do not have the ability to maintain an expanded plasma volume against general dehydration. (Gloyd-Arizona)
W73-12788

EFFECT OF LEVEL OF SOIL MOISTURE ON NITROGEN MINERALIZATION AND NITRIFICATION DURING INCUBATION OF EAST PAKISTAN TEA SOILS,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
M. Ishaque, and A. H. Cornfield.
Bangladesh J Biol Agric Sci. Vol 1, No 1, p 52-58. 1972.
Identifiers: *East Pakistan, Incubation, Microbial activity, Mineralization, *Nitrification, Nitrogen, Soils, Tea soils, *Soil moisture.

The effects of varying static moisture contents (20-100% maximum water holding capacity, mwhc) on levels of mineral-N (NH4- and NO3-N) during incubation at 30C for 2, 5 and 12 wk of low flat (LF) and high flat (HF) tea soils (pH 4.1 and 4.2) were studied. The optimum moisture content for mineral-N accumulation after 12 wk was 40% mwhc for the LF soil and 100% mwhc for the HF soil. During 5 wk of incubation the HF soil generally accumulated more mineral-N than did the LF soil at all moisture contents. After 12 wk of incubation there was a little difference in mineral-N accumulation at 20-60% mwhc between the 2 soils, but at 80-100% mwhc accumulation was considerably higher in the HF soil. There was small nitrate accumulation in the LF soil at the lower moisture contents but only with up to 5 wk of incubation. In the HF soil there was fair accumulation of nitrate at all moisture contents.--Copyright 1973, Biological Abstracts, Inc.
W73-12799

SIGNIFICANCE OF HEATING AGRICULTURAL SOILS,
Indian Inst. of Science, Bangalore. Dept. of Biochemistry.
G. K. Viswanath, and S. C. Pillai.
Indian J Agric Sci. Vol 42, No 1, p 75-80. 1972. Illus.
Identifiers: Aeration, Agriculture, Ammonium sulfate, Crop yields, *Heating soil, Phosphates, Soils, Sulfate, *Water reuse, *Soil treatment.

The formation and stabilization of water-stable aggregates under the influence of temperature in soils treated with different amounts of water, sewage, other forms of organic matter and inorganic fertilizers were studied. At higher temperatures attained in soils, either naturally or artificially, the total percentage of water-stable aggregates increased. Treatment of soils with (NH4)2SO4 and superphosphate and subsequent drying at 103C not only increased the water-stable aggregates to the maximum extent but also transformed all of them into aggregates larger than 2 mm in diameter. The increase in the water-stable aggregates and consequent improvement of aeration of the heated soils are the main reasons for getting higher crop yields.--Copyright 1973, Biological Abstracts, Inc.
W73-12802

DIURNAL AND SEASONAL EFFECTS OF ENVIRONMENT ON PLANT WATER RELATIONS AND FRUIT DIAMETER OF CITRUS,
New York State Coll. of Agriculture, Ithaca. Dept. of Pomology.
D. C. Elfving, and M. R. Kaufmann.
J Am Soc Hortic Sci. Vol 97, No 5, p 566-570. 1972. Illus.
Identifiers: *Citrus, Diurnal, Moisture, Permeability, Pressure, Roots, Seasonal, Shrinkage, Soils, Temperature, Vapor, *Soil water, *Leaf water potential.

Leaf water potential of 'Valencia' orange trees was influenced by soil water availability, soil temperature (T) and vapor pressure deficit (VPD) of the atmosphere. Low soil water availability prevented full nighttime recovery from water stress. Soil T below 15C decreased root permeability for water absorption and contributed to low daytime water potentials (high water stress), but at night when transpiration was minimal, complete recovery occurred. VPD effects on leaf water potential were also most noticeable during the day. Stage II fruits exhibited a recurring diurnal size change during daylight hours. This reversible shrinkage was correlated with simultaneous changes in fruit and leaf water potential and fruit diffusion resistance. However, the irreversible nighttime growth rate could not be correlated with day or night water potentials of air T, or with night VPD. While differences between fruit and leaf water potentials occurred, no evidence permits an unequivocal statement that transpiring fruits can behave as a midday reservoir of water for leaves.--Copyright 1973, Biological Abstracts, Inc.
W73-12805

PROTEIN CONTENT OF BROWN RICE BY UPLAND POLYETHYLENE FILM MULCHING CULTURE, (IN JAPANESE),
H. Taira, H. Taira, and F. Furusawa.
Proc Crop Sci Soc Jap. Vol 41, No 2, p 160-165. 1972. (English summary).
Identifiers: *Mulch, Polyethylene film, *Protein, *Rice (Brown).

The upland mulching culture had a higher protein content in lowland brown rice as compared with the lowland culture. The average increasing index, (upland mulching culture/lowland culture) x 100, of the nonglutinous and glutinous types was 120.6% and 122.6%. The upland mulching culture also gave higher protein content in lowland and lowland-upland hybrid brown rice as compared with the upland culture on the same manuring condition. The average increasing index, i.e., (upland mulching culture/upland culture) x 100, is as follows: lowland brown rice: non-glutinous type 106.0% and glutinous type 107.6%; lowland-upland hybrid brown rice: non-glutinous type 106.9% and glutinous type 107.2%.--Copyright 1973, Biological Abstracts, Inc.
W73-12806

REUSE OF HUMAN WASTES IN AGRICULTURE,
Asian Inst. of Tech., Bangkok (Thailand).
For primary bibliographic entry see Field 05D.
W73-12817

ECOLOGICAL INFORMATION ON THE DIFFERENCES IN THE NUMBER OF CULEX TRITAENIORHYNCHUS LARVAE AMONG PADDY FIELDS (IN JAPANESE),
Osaka Prefecture Inst. of Public Health (Japan).
H. Nakamura, M. Yoshida, S. Ito, and K. Tonomura.
Jap J Sanit Zool. Vol 22, No 3, p 176-181, 1971, Illus. English summary.
Identifiers: Culex-tritaeniorhynchus, Density, Ecological studies, Food, *Japan, Larvae, *Paddy fields, Pupa, Seasonal, *Mosquitos.

The seasonal fluctuation of the density of larvae and pupae of C. tritaeniorhynchus in paddy fields was investigated at Sijyonawate-cho (Japan), 1968-1969. The number of larvae and pupae varied seasonally at each paddy field. In some paddy fields, the number of larvae and pupae tended to be maintained at relatively high levels. In other paddy fields, the number of larvae and pupae was always smaller than the average. The number of first and second instar larvae tended to be larger in the paddy fields in which the density of larvae was always high than in the ones in which the density was low. Water samples were taken from the paddy fields to check the survival rate of the first

instar larvae in the laboratory at 30C, 16 hr illumination. Survival rate was higher in the water from the paddy fields where larvae were abundant. Higher survival rate was observed in the water taken from the paddy field at certain seasons when the number of larvae was high. However, when 0.1 g of artificial food per pot was added to the water from paddy fields in which the density of larvae was low, the survival rate increased. This suggests that the low value in the survival rate in water from some paddy fields may be attributed to the deficiency of food.–Copyright 1973, Biological Abstracts, Inc.
W73-12829

AQUALCULUTRE: THE FARMING AND HUSBANDRY OF FRESHWATER AND MARINE ORGANISMS,
J. E. Bardach, J. H. Ryther, and W. O. McLarney.
Wiley-Interscience, a division of John Wiley and Sons, Inc.: New York, N.Y., U.S.A.; London, England. 1972. Pr.$37.50. 868p, Illus, Map.
Identifiers: Animals, *Aquaculture, Books, Farming, *Fresh water organisms, Husbandry, *Marine organisms, Plants.

A world-wide species by species illustrated description is provided of all aquatic plants and animals that are cultivated for food and the methods by which this is accomplished. Biological and ecological considerations of the organisms, the current and projected state-of-the-art of their cultivation, and yields, diseases and other problems are discussed. General principles and economics are dealt with in the first chapter. Whereever possible, data concerning yields, economics, lists of food organisms, nutritional requirements, and other pertinent topics are presented in tabular form. A total of 43 chapters are included on the culturing of various groups of freshwater and marine organisms. An appendix, pond siting and construction, provides technical information on pond culture in general. The book ends with an index of names of animals and plants, and an index of persons, places and institutions of interest to investigators interested in aquaculture.--Copyright 1973, Biological Abstracts, Inc.
W73-12830

EFFECT OF SOIL MOISTURE ON THE GROWTH OF MACROPHOMINA PHASEOLI, SCLEROTIUM ROLFSII AND FAUSARIUM SOLANI IN SOIL,
Jute Agricultural Research Inst., Barrackpore (India).
T. P. Mustafee, and S. B. Chattopadhyay.
Indian J Microbiol. Vol 11, No 4, p 77-82. 1971.
Identifiers: Fusarium-Solani, Growth, Macrophomina phaseoli, Sclerotium rolfsii, *Soil moisture, *Fungi.

Experiments were conducted at soil moisture levels of 20, 40, 60 and 80% saturation. The 40% saturation level was most effective for F. solani; at 80%, steady decline occurred. For M. phaseoli, 60% was favorable; at 20%, it showed an unfavorable reaction. A steady decline in S. rolfsii population was noted at all levels of saturation, especially at 80%; the fungus could not be detected 20 days after inoculation of the soil.–Copyright 1973, Biological Abstracts, Inc.
W73-12831

THE EFFECT OF IRRIGATION DEPTH ON ROOT GROWTH OF SOME PASTURE SPECIES,
Melbourne Univ., Parkville (Australia). Dept. of Agricultural Engineering.
P. W. Cullen, A. K. Turner, and J. H. Wilson.
Plant Soil. Vol 37, No 2, p 345-352. 1972. Illus.
Identifiers: Depth, Growth, Irrigation, Lolium-Perenne, Pasture species, *Root depth, Trifolium-Repens, Trifolium-Subterraneum, *Root growth.

Within the limits of the experiment, 60 cm, the depth of rooting of 3 pasture species in a sandy loam soil was found to be directly affected by the depth to which irrigation water penetrated the soil. Some practical implications for irrigation farming are discussed. The species reacted differently to the deeper wetting treatments; white clover (Trifolium repens) produced a larger weight of roots, subterranean clover (T. subterraneum) a lesser weight, and there was no difference in the weight of roots with perennial ryegrass (Lolium perenne). However, the weight of roots relative to the total weight of the plant decreased with increase in the wetting depth in all 3 species. The effect of the growth of roots on the total growth of the plants is discussed and it is suggested that root growth is not a determinate of total production when the supply of nutrients is not limiting. The vertical distribution of the roots is discussed.–Copyright 1973, Biological Abstracts, Inc.
W73-12834

GERMINATION OF WHEAT AS AFFECTED BY SOIL WATER STRESS,
Manitoba Univ., Winnipeg. Dept. of Soil Science.
M. C. Pawloski, and C. F. Shaykewich.
Can J Plant Sci. Vol 52, No 4, p 619-623. 1972. Illus.
Identifiers: *Hydraulic conductivity, Membranes, *Soil-water stress, *Wheat germination.

Germination rate of wheat was determined at several water potentials (-0.8, -5.3, -7.8, and -15.3 bars) on 2 soils and a semi-permeable membrane. Germination rate decreased as matric potential decreased. At a given water potential, germination rates were the same for both soils but germination on the membrane system was faster than on soils. Hydraulic conductivity was different on the 2 media, indicating that the hydraulic conductivity is an important component of soil water stress. Germination rate was not affected by decreasing water potential to -7.8 bars on each medium. At the -15.3-bar potential germination rate was considerably slower.–Copyright 1973, Biological Abstracts, Inc.
W73-12884

EFFECT OF ENVIRONMENTAL FACTORS ON WATER UTILIZATION AND BORON ACCUMULATION AND TRANSLOCATION IN SUGARCANE,
Hawaii Agricultural Experiment Station, Honolulu.
J. E. Bowen.
Plant Cell Physiol, Vol 13, No 4, p 703-714, 1972.
Identifiers: *Boron, Environmental effects, Humidity, Light *Sugarcane, Temperature, Translocation, Transpirant, Water utilization, Crop yield.

Rates of Boron (B) accumulation and/or water utilization of 3 mo.-old sugarcane plants were altered by changes in temperature, relative humidity, light intensity and duration of exposure to light. The effects of the environment on B accumulation were not directly dependent upon effects on water utilization. B accumulation was affected more than water uptake by increasing root and air temperatures from 8 deg C-37 deg C, and by raising the pH of the external solution from 5.7-7.0. Contrarily, water utilization decreased more than B accumulation when the relative humidity was increased from 30 plus or minus 5% - 95 plus or minus 5%, when light intensity was decreased or daily exposure to light was shortened and when the plants were pretreated with 5 x 10 0.00001 M phenylmercuric acetate, an anti-transpirant. The absorption of B by roots was experimentally separated from its subsequent translocation to the shoots. Absorption of B by roots was at least partially under metabolic control, since uptake from a 2 mg/l B solution could occur against a concentration gradient. Translocation of B from the roots to the shoot occurred passively in the transpiration stream.–Copyright 1973, Biological Abstracts, Inc.
W73-12966

INFLUENCE OF CERTAIN ROTATIONS UPON COTTON PRODUCTION IN THE SAN JOAQUIN VALLEY,
Agricultural Research Service, Shafter, Calif. Cotton Research Station.
J. H. Turner, E. G. Smith, R. H. Garber, W. A. Williams, and H. Yamada.
Agron J. Vol 64, No 4, p 543-546. 1972.
Identifiers: *Crop production, Alfalfa, Corn, *Cotton, Gossypium hirsutum D, Infiltration, Medicago sativa D, *Rotations, *San Joaquin Valley, Verticillium, Wilt, Zea mays M, Fertilization.

Cotton (Gossypium hirsutum L.) is the major cash commodity from San Joaquin Valley farms. Frequently, growers plant cotton for 3-6 yr without rotation. Alfalfa for hay production or grain crops planted on land removed from cotton. Very few rotation studies with cotton have been conducted in the western states. The purpose of this experiment was to determine the effect of certain rotations and N applications on growth and yield of cotton. Increased yields were obtained for cotton following alfalfa (Medicago sativa L.) and cotton following corn (Zea mays L.) over the continuous cotton plots. No advantage for yield was shown between cotton following corn and cotton following alfalfa. N fertilization increased yields of continuous cotton, of cotton following corn, and of cotton the second yr following alfalfa, but not of cotton the first yr after alfalfa. Water infiltration data showed that a significant reduction of water intake occurred on the N subplots compared to those with no N. Plant heights were significantly different at first-bloom stage for both the rotation and the N treatments. Final plant height at maturity, however, was seldom influenced by rotation treatment. The N treatment producted taller plants in most years. Verticillium wilt was more prevalent in the continuous cotton than in the cotton following other crops. Wilt was also more prevalent on the N-fertilized subplots. Growing continuous cotton lowered the yields, hindered early season growth, and increased Verticillium wilt. N fertilization reduced infiltration rate of water, which is an important consideration to farm managers in this area.–Copyright 1972, Biological Abstracts, Inc.
W73-12975

EFFECTS OF WATER STRESS ON NITROGEN--FIXING ROOT NODULES: IV. EFFECTS ON WHOLE PLANTS OF VICIA FABA AND GLYCINE MAX,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
J. L. Sprent.
New Phytol. Vol 71, No 4, p 603-611. 1972. Illus.
Identifiers: Glycine-max, *Nitrogen, Photosynthesis, *Root nodules, Soil, *Soybeans, Tritiated water, Vicia-faba.

Water stress reduced N fixation of soybean plants grown in the pots of sand. Provided that the nodules retained some activity, recovery on watering was normally complete in an hour. Using tritiated water (3HOH) it was confirmed that water could be withdrawn by nodules en route from the root to the shoot system. A field trial with V. faba showed a high degree of correlation between soil-water content and N-fixing activity. Slow natural drying over a 6-wk period resulted in progressive reduction of activity, which was restored by irrigation. Maximum N fixation occurred at about field capacity; above this, activity was reduced due to waterlogging. Under the conditions of the experiment, water supply was the major environmental factor affecting N fixation. It is suggested that water stress affects nodule activity directly, but that this effect may be aggravated by reduced supplies of photosynthate from wilted leaves. (See also W73-02633).–Copyright 1973, Biological Abstracts, Inc.
W73-12977

EDAPHIC AND WATER RELATIONSHIPS OF ALDICARB AND ITS METABOLITES,
North Dakota State Univ., Fargo. Dept. of Entomology.
For primary bibliographic entry see Field 02G.
W73-12979

VIRUSES INFECTING PEACHES IN THE MURRUMBIDGEE IRRIGATION AREAS OF NEW SOUTH WALES,
New South Wales Dept. of Agriculture, Rydalmere (Australia). Biological and Chemical Research Inst.
R. D. Pares, L. J. Penrose, and P. F. Kable.
Aust J Exp Anim Husb. Vol 12, No 57, p 447-448. 1972.
Identifiers: *Australia, Irrigation, *Mottle virus, Murrumbidgee, Necrotic, New-South-Wales, *Peaches, Prunus, Ringspot, *Viruses.

Prunus necrotic ringspot and dark green sunken mottle viruses were present in canning peaches.--Copyright 1973, Biological Abstracts, Inc.
W73-12981

EVALUATION OF TENSIOMETERS FOR ESTIMATING PLANT WATER STRESS IN CITRUS,
New York State Coll. of Agriculture, Ithaca. Dept. of Pomology.
M. R. Kaufmann, and D. C. Elfving.
Hortscience. Vol 7, No 5, p 513-514. 1972. Illus.
Identifiers: *Citrus, Diffusion, Leaf, Matric, Soils, Temperature, *Tensiometers, Water stress, *Leaf-water potential.

Field measurements of leaf water potential were made on 'Valencia' orange trees subjected to varying degrees of soil water availability. During the night, leaf water potentials were reasonably well correlated with tensiometer estimates of soil matric potential. During the day, however, leaf water potentials were unrelated to matric potential because plant water balance was influenced by other factors in the shoot and root environments, including vapor pressure deficit, leaf diffusion resistance, and soil temperature.--Copyright 1973, Biological Abstracts, Inc.
W73-12985

CONSUMPTIVE USE OF WATER BY COTTON GROWN IN TRANSITION TRACT OF DHARWAR UNDER RAINFED CONDITIONS,
College of Agriculture, Dharwar (India).
G. Hunsigi, G. K. Kulkarni, B. H. Katarki, and D. M. Amernath.
Mysore J Agric Sci. Vol 6, No 1, p 38-42. 1972. Illus.
Identifiers: *Consumptive use, *Cotton, Equations, Evaporation, *India (Dharwar), Rainfed conditions, Regression, Transition.

The Blaney and Criddle formula predicts more favorably the actual consumptive use of cotton then Lowry and Johnson's. A highly significant correlation was observed between the open pan evaporation (Eo) and the consumptive use (Cu) obtained by the 2 empirical methods. Linear regression equations are drawn between Eo and Cu.--Copyright 1973, Biological Abstracts, Inc.
W73-12988

CHARACTERIZATION OF EXUDATION FROM EXCISED ROOTS OF ONION, ALLIUM CEPA: I. WATER FLUX,
Liverpool Univ. (England). Dept. of Botany.
R. K. M. Hay, and W. P. Anderson.
J Exp Bot. Vol 23, No 76, p 577-584. 1972. Illus.
Identifiers: Allium-Cepa, *Exudation, Flux, *Onion roots, Hydraulic conductivity.

Measurements of the rates of fluid exudation from excised roots of onion, and determinations of the osmolalities of the exudate fluids are found to be adequately related by the simplest model in which the rate of fluid exudation is proportional to the osmotic pressure difference between the exudate fluid and the bathing solution. The mean hydraulic conductivity of roots produced by unsprouted onion bulbs is 0.44 x 0.000001 cm s-1 atm-1 and of roots from sprouted bulbs is 0.91 x 0.000001 cm s-1 atm-1.--Copyright 1973, Biological Abstracts, Inc.
W73-12989

ANTITRANSPIRANT FILM: CURTAILING INTAKE OF EXTERNAL WATER BY CHERRY FRUIT TO REDUCE CRACKING,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 02D.
W73-12992

ANTITRANSPIRANTS FOR CONSERVATION OF LEAF WATER POTENTIAL OF TRANSPLANTED CITRUS TREES,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 02D.
W73-12993

INFLUENCE OF WATER POTENTIAL ON GROWTH, ANTIBIOTIC PRODUCTION AND SURVIVAL OF CEPHALOSPORIUM GRAMINEUM,
Washington State Univ., Pullman. Dept. of Plant Pathology.
For primary bibliographic entry see Field 05B.
W73-12999

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

ANNUAL REPORT OF THE NEW YORK STATE URBAN DEVELOPMENT CORPORATION, 1972.
New York State Urban Development Corp., New York.
For primary bibliographic entry see Field 03D.
W73-12356

REGIONAL UTILITIES STUDY: DRAINAGE VOLUME OF TECHNICAL APPENDIX.
Minges (James S.) and Associates, Inc., Farmington, Conn.

Prepared for Capitol Region Planning Agency, Hartford, Conn., 1969. 97 p, 8 fig, 23 tab, 44 ref, glossary. UPA: Conn. P-78 (G).

Descriptors: *Drainage, *Watersheds, *Drainage programs, Flood flow, Flood data, Land use, Flood protection, Non-structural alternatives, Projections, Planning, *Connecticut, Regional analysis, Regional development.
Identifiers: Hartford (Conn), Capitol Region (Conn), Bigwood-Thomas Flood Flow Formula.

Detailed background data related to drainage and used to formulate plans and programs presented in the Technical Report on the Regional Utilities Study is given in outline form and working tables. Illustrating the planning methods and approaches used to formulate the final plans, the data and planning outlines fall under several categories: (1) background data such as population and land use plus descriptions of data collection procedures and approaches for evaluating alternatives; (2) drainage data such as flood control structures, flood records, climate, gaging stations, and areas of watersheds; (3) drainage plan elements including proposed open space areas, channel improvements, flood plain zoning, and encroachment lines; (4) numerous tables of data relating to the watersheds, their drainage basin areas and flows; and (5) flood flow determination procedures by use of Bigwood-Thomas Formula and the Rational Formula. (Elfers - North Carolina)
W73-12368

THEORY OF PRECIPITATION EFFECTS ON DEAD CYLINDRICAL FUELS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02B.
W73-12381

SIXTEENTH ANNUAL ARIZONA WATERSHED SYMPOSIUM PROCEEDINGS.
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 04D.
W73-12403

ANALYSIS OF SEEPAGE INTO GROUND--WATER SYSTEM,
Ife Univ. (Nigeria). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04B.
W73-12412

PROBLEMS IN THE PRODUCTION OF A SPRING FLOOD (VOPROSY FORMIROVANIYA VESENNEGO POLOVOD'YA).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, A. A. Sokolov, editor, Leningrad, 1972. 256 p.

Descriptors: *Floods, *Spring, *Soils, *Soil moisture, Soil properties, Water balance, Water storage, Precipitation (Atmospheric), Runoff, Evaporation, Recharge, Water loss, Water yield, Watersheds (Basins), Hydrographs, Snowmelt, Water equivalent, Forests, Grasslands, Forecasting, Snow surveys.
Identifiers: *USSR, Valday Field Laboratory, Don River, Nomograms.

Spring floods in forest-steppe and forested regions of European Russia were analyzed for improvement of current methods for forecasting and computing components of a flood hydrograph and snowmelt losses to water absorption and evaporation in a river basin. Factors producing the outstanding spring flood of 1970 on rivers in the Central Black Earth region are examined, and studies are made of soil moisture storage in the Don River basin, water properties of frozen soils, water equivalent of snow, spring-runoff losses to basin recharge, and problems related to evaluation and analysis of items in the water balance. Data used in preparation of this collection of 14 papers are based on laboratory and on-site investigations by the Leningrad State Hydrologic Institute and on observation data of a network of stations ofthe Hydrometeorological Service. (See W73-12436 thru W73-12444) (Josefson-USGS)
W73-12435

INVESTIGATION OF THERMAL PROPERTIES OF SOILS IN THE DON RIVER BASIN FOR ESTIMATION OF SNOWMELT LOSSES TO INFILTRATION INTO FROZEN SOIL (ISSLEDOVANIYE TEPLOVYKH SVOYSTV POCHV BASSEYNA R. DONA DLYA OTSENKI POTER' TALYKH VOD NA IN FIL'TRATSIYU V MERZLUYU POCHVU),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W73-12436

LABORATORY INVESTIGATIONS OF THE TRANSMISSION CAPACITY OF FROZEN AND THAWED SOILS BASED ON DATA OF THE VALDAY FIELD LABORATORY (VNIGL) (LABORATORNYYE ISSLEDOVANIYA VODOPROPUSKNOY SPOSOBNOSTI MERZLYKH I TALYKH POCHVO-GRUNTOV (PO MATERIALAM MERZLOTHOY LABORATORII VNIGL)),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W73-12437

PRINCIPLES FOR ESTIMATING AND FORECASTING WATER LOSSES IN SPRING ON WATERSHEDS IN NORTHWESTERN EUROPEAN USSR (PRINTSIPY OTSENKI I PROGNOZA POTER' VESENNIKH VOD NA VODOSBORAKH SEVERO-ZAPADA YETS),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W73-12438

ESTIMATION AND FORECAST OF WATER LOSSES DURING A SPRING FLOOD TO GROUNDWATER RECHARGE FOR WATERSHEDS IN NORTHWESTERN EUROPEAN USSR BASED ON DATA OF THE VALDAY FIELD LABORATORY (OTSENKA I PROGNOZ POTER' VODY V PERIOD VESENNE GO POLOVOD'YA NA POPOLNENIYE ZAPASOV GRUNTOVYKH VOD DLYA VODOSBOROV SEVERO-ZAPADA YETS (PO MATERIALAM VNIGL)),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W73-12439

FACTORS PRODUCING THE OUTSTANDING SPRING FLOOD OF 1970 IN UPPER DON RIVER BASINS (USLOVIYA FORMIROVANIYA VYDAYUSHCHEGOSYA VESENNEGO POLOVOD'YA 1970 G. V BASSEYNAKH REK VERKHNEGO DONA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W73-12440

RESULTS OF A STUDY OF WATER REGIME OF SOILS ON SMALL WATERSHEDS IN THE DON RIVER BASIN (REZUL'TATY IZUCHENIYA VODNOGO REZHIMA POCHV MALYKH VODOSBOROV V BASSEYNE R. DONA),
Gosudarstvenni Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W73-12441

EVAPORATION DURING A FLOOD PERIOD CAUSED BY SPRING SNOWMELT (ISPARENIYE V PERIOD VESENNEGO SNEGOTAYANIYA I POLOVOD'YA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02D.
W73-12442

SOME HYDROPHYSICAL CHARACTERISTICS OF SOILS IN THE DON RIVER BASIN TO KAZANSKAYA STATION (NEKOTORYYE VODNO-FIZICHESKIYE KHARAKTERISTIKI POCHV BASSEYNA R. DONA DO ST-TSY KAZANSKOY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W73-12443

METHODS OF DETERMINING SOIL MOISTURE STORAGE IN WINTER (K METODIKE OPREDELENIYA VLAGOZAPASOV POCHVY V ZIMNIY PERIOD GODA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W73-12444

THE MULTIPURPOSE DEVELOPMENT OF THE RIVER RHONE VALLEY,
Compagnie Nationale du Rhone, Lyon (France).
C. Gemaehling, and P. Savey.
Water Power, Vol 24, No 11, p 403-410, Nov 1972. 4 fig, 7 photo, 2 tab.

Descriptors: *River basin development, Water resources development, Economic impact, *Multiple purpose projects, Watershed management, Automatic control, Hydroelectric power, Bulb turbines, Navigable rivers, Navigation, Land development, Foreign projects, Planning, Management.
Identifiers: France, Rhone River (France), Hydroelectric resources, Locks (Waterways).

The Rhone River Valley is being developed by the Compagnie Nationale du Rhone (CNR) for navigation, hydroelectric power, and agricultural water. The development plan consists of a series of low-head stations spaced about 15 to 30 km apart. Each of the 21 stations planned consists of a dam, reservoir, branch canal, power station, and navigation locks. Presently, the project power stations contribute over 8% of the total electric power production in France. Vertical shaft Kaplan turbine units were used in the early plants, but increased economy has brought changes to bulb-type equipment and also to computerized automation of all the plants. By 1975, navigation locks should make navigation possible from the Mediterranean Sea to 250 km inland. For each development, the CNR cooperates with the Ministry of Agriculture to completely reorganize local agriculture. This complex development project tends to modernize and industrialize the area surrounding the Lyons-Marseilles axis. (USBR)
W73-12467

HEURISTIC RANKING AND PRIORITIZING UNDER SUBJECTIVE CONDUCTIONS,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 06B.
W73-12470

HYDROLOGICAL RESERVOIR DESIGN USING BASIC SYSTEMS THEORY TECHNIQUES,
Lahmeyer International G.m.b.H., Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 08A.
W73-12471

RESERVOIR-YIELD ESTIMATION PROCEDURES,
British Columbia Univ., Vancouver.
C. S. Joy, and T. A. McMahon.
Inst Eng, Aust, Civ Eng Trans, Vol CE14, No 1, p 28-36, Apr 1972. 11 fig, 8 tab, 33 ref.

Descriptors: *Reservoir yield, *Reservoir storage, *Reservoir design, Forecasting, Stochastic processes, Low flow, Streamflow, Storage capacity, Hydrology, Probability, Mathematical models, Bibliographies, *Australia.
Identifiers: Foreign studies, Stochastic data simulation, *Reservoir capacity, Reservoirs, Mathematical analysis, Streamflow records.

Methods of determining reservoir storage capacity are critically reviewed and applied to 6 Australian rivers. The storage procedures are divided into critical period, stochastic, and data generation techniques. Procedures in critical period techniques are applicable only for preliminary design. Conclusions regarding this technique are: (1) Of the lowflow techniqes, Alexander's procedure is recommended. Equally acceptable are the monthly and annual behavioral techniques. (2) Discrepancies arise in the techniques of Stall and Thompson. (3) Hardison's technique tends to overestimate the required storage. The procedures of stochastic and data generation techniques are regarded as final design techniques. Conclusions regarding these techniques are: (1) the modified procedures of Gould were the most satisfactory, and (2) both of Moran's techniques neglect the time dependence of inflows. Results from 2 synthetic data generating models illustrate that a suitable model must satisfactorily preserve the characteristics of correlated seasonal flows that are highly skewed. Although the skewed seasonal model of Thomas and Burden gave adequate results for the Yarra River, the model was not applied to more highly skewed flows. Kartvelishvli's approach may be more satisfactory for highly skewed data. (USBR)
W73-12478

HYDROLOGIC MODELS FOR POORLY DEFINED DRAINAGE AREAS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 02A.
W73-12496

HERBICIDE CONTAMINATION OF SURFACE RUNOFF WATERS,
Utah State Univ., Logan. Dept. of Plant Science.
For primary bibliographic entry see Field 05B.
W73-12511

CHENA RIVER LAKES PROJECT, ALASKA, PROBLEMS RELATING TO CHANNEL DEVELOPMENT, EROSION, AND BANK AND LEVEE PROTECTION,
Committee on Channel Stabilization (Army).
For primary bibliographic entry see Field 08B.
W73-12559

SELECTIVE WITHDRAWAL FROM MAN-MADE LAKES, HYDRAULIC LABORATORY IVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
J. P. Bohan, and J. L. Grace, Jr.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-73-4, March 1973. 28 p, 25 pl.

Descriptors: *Lakes, *Hydraulic models, *Reservoirs, *Stratified flow.
Identifiers: *Selective withdrawal.

Laboratory investigations were conducted to determine the withdrawal-zone characteristics created in a randomly density-stratified impoundment by releasing flow through a submerged orifice, over a free and submerged weir, or through a combination of the above. Density stratification was generated in the experimental facilities by creating differentials in both temperature and salinity. Velocity profiles were obtained from movies of dye streak displacements. Through the investigations, generalized relationships for describing the vertical limits of the withdrawal zone and the vertical velocity distribution within the zone have been developed. Techniques for handling conditions in which the water surface or bottom boundary controlled the limits of the withdrawal zone and for describing the composite celovity profile resulting from withdrawal zones which overlapped have also been developed. If the velocity profile and the reservoir width with respect to depth are known, a vertical flow rate distribution can be determined. This flow rate distribution can then be applied as a weighting func-

tion to the reservoir profile of any water-quality parameter to determine its value in the reservoir release. (WES)
W73-12569

DISPOSAL OF DREDGE SPOIL; PROBLEM IDENTIFICATION AND ASSESSMENT AND RESEARCH PROGRAM DEVELOPMENT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
M. B. Boyd, R. T. Saucier, J. W. Keeley, R. L. Montgomery, and R. D. Brown.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-72-8, November 1972. 121 p, 1 pl, 1 app.

Descriptors: *Dredging, *Environmental effects, *Spoil banks, *Disposal.
Identifiers: *Dredge spoil.

Report contains results of two study phases of the dredge spoil disposal study: problem identification and assessment and research program development. Result of assessment is that the nature and magnitude of effects of dredging and spoil disposal on water quality and aquatic organisms require extensive research and research is needed to make confined land disposal a viable disposal alternative. A broad-based research program is outlined and recommended to develop a wide choice of technically satisfactory, environmentally compatible, and economically feasible disposal alternatives to cover the wide variety of dredging and disposal operations and environments. In addition to research concerning effects of dredging and open water disposal on water quality and aquatic organisms, ways would be sought to facilitate and improve overall effectiveness and acceptability of land disposal. Attention would be devoted to modifying dredge plant equipment and operational procedures to reduce environmental impact, and to physical, chemical, and/or biological spoil improvement methods. New disposal concepts would be considered along with utilization of spoil for productive uses such as landfill and land enhancement. (WES)
W73-12573

REPORT ON ARKANSAS VALLEY CONDUIT FOR SOUTHEASTERN COLORADO WATER CONSERVANCY DISTRICT, FOUR CORNERS REGIONAL COMMISSION AND U.S. BUREAU OF RECLAMATION.
Black and Veatch, Kansas City, Mo.

Available from NTIS, Springfield, Va. 22151 as COM-73-10356 Price $3.00 printed copy; $1.45 microfiche. Report, 1972. 127 p, 17 fig, 19 tab, 20 ref, 2 append.

Descriptors: *Water importing, *Colorado, *Rocky Mountain region, *Water transfer, Planning, Water supply, Agriculture, Municipal water, Industrial water, Flood control, Electric power plants, Reservoirs, Recreation facilities, Costs, Pipelines, Water conveyance, Water sources, Evaluation, Water demand.
Identifiers: *Arkansas Valley (Colo).

The Fryingpan-Arkansas Project is a multiple purpose project of the U.S. Bureau of Reclamation involving transmountain diversion of waters from the western slope of the Continental Divide into the Arkansas River basin. The imported waters will provide an additional supply for agriculture, municipalities, and industry. Flood control, recreation, and power generation are other benefits of the project. Pueblo Dam and Reservoir, an element of the project, is presently under construction on the Arkansas River about five miles west of Pueblo. Completion of the dam is anticipated in late 1975. The Southeastern Colorado Water Conservancy District is the legal entity to contract with the Federal Government for purchase and subsequent resale of project waters. Only those entities within the boundaries of the district are eligible to receive project water. However, there are provisions in the State law under which the district operates to permit expansion of the district's boundaries. All feasible ways were studied to supply project waters, raw or treated, to the valley entities for potable purposes, considering both desalting and conventional water treatment methods and, based on these studies, to present the most economical overall supply method. (Woodard-USGS)
W73-12577

FORECASTING STORM-INDUCED BEACH CHANGES ALONG VIRGINIA'S OCEAN COAST,
Virginia Inst. of Marine Science, Gloucester Point.
W. Harrison, P. A. Bullock, and N. A. Pore.
Available from NTIS, Springfield, Va. 22151 as AD-752 141 Price $3.00 printed copy; $1.45 microfiche. Final Contract Report, December 31, 1971. 105 p, 66 fig, 14 tab, 12 ref, 5 append. Contract DACW72-69-C-0031.

Descriptors: *Beach erosion, *Geomorphology, *Sediment transport, *Littoral drift, *Storms, *Virginia, Coasts, Atlantic ocean, Waves (Water), Forecasting, Methodology, Meteorological data, Regression analysis, Sands, Tides, Winds, Currents (Water).
Identifiers: *Beach profile changes.

A method for operational prediction of storm-induced beach changes is presented. The method uses wind and storm-surge data that are predicted on a routine basis by the National Weather Service, NOAA, and it was felt that if such a procedure could be developed, it would be possible to provide estimates of beach erosion or deposition as part of routine weather forecasts whenever storms threatened. Beach profile changes were observed for 18 months at 16 transects along the Virginia ocean coast. Whenever possible profiling was done just before and after storms. Changes in beach sand volume computed from the profile data were correlated by linear multiple regression techniques with (1) analyzed U and V-wind components of the 1000-mb wind for several of the pertinent grid points on the National Meteorological Center's northern hemisphere grid, and (2) ocean stillwater levels recorded at two tide gages. The correlation studies did not yield completely reliable predictor equations. (Woodard-USGS)
W73-12584

HORTON'S 1945 STUDY: A CARTOBIBLIOGRAPHY,
Indiana Univ., Bloomington. Dept. of Geography.
For primary bibliographic entry see Field 07C.
W73-12596

CONTROL OF UNDERSEEPAGE BY RELIEF WELLS, TROTTERS, MISSISSIPPI; APPENDIX K: 1969 PUMPING TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W73-12597

EFFECTS OF STREAM CHANNELING ON WETLANDS IN A MINNESOTA WATERSHED,
New Brunswick Fish and Wildlife Branch, Fredericton.
J. S. Choate.
J Wildl Manage. Vol 36, No 3, p 940-944. 1972. Illus.
Identifiers: Channeling, *Minnesota, *Stream channeling, Watersheds, *Wetlands, Wildlife.

Over 60 miles of stream was channeled in the lower 3/4 of the Hawk Creek Watershed, west-central Minnesota. The channels permitted more rapid removal of flood waters but also encouraged construction of ditches and tiles by providing improved outlets. Wetlands valuable to waterfowl and other wildlife were drained as a result. On a percentage basis, wetland loss in the lower part of the watershed was nine times greater than in the unchanneled upper quarter.—Copyright 1973, Biological Abstracts, Inc.
W73-12667

PUBLIC LAND USE POLICY: NEEDS, OBJECTIVES, AND GUIDELINES,
Iowa State Univ., Ames. Dept. of Economics.
J. F. Timmons.
Journal of Soil and Water Conservation, p 195-201, September-October, 1972. 2 fig, 12 ref. OWRR A-999-IA (6).

Descriptors: *Land use, *Legislation, *Decision making, Long-term planning, Environment, Land management, Standards, Costs, Methodology, Social participation, Governmental interrelations, Land tenure.
Identifiers: *Land use policy, Policy formulation, Guidelines.

Evidence supports widespread recognition by the public, governments and the academic community of the need for developing land use policies. The subject deserves careful consideration when the initial policies are formulated. Towards this goal a general discussion of alternative concepts of land, various land uses which might constrain the selection of land tenure systems, and goals of land use policy is provided. The vast variety of land uses and the availability and choice of technologies involved necessitate the development of a policy that specifies the range of choice among alternatives, given desired social objectives. Land resource use and environmental quality must be approached in conjunction with other national goals. Effective land use policy must be based on facts and logic widely understood and accepted by the public. Guidelines for the formulation of effective policy include definition of policy objectives which are flexible, sensitive to results of continued research and evaluation, founded upon a consistent, integrated system of programs involving all levels of government and perhaps even open to change of traditional concepts. (Weaver-Wisconson)
W73-12697

INVESTIGATION OF MINERAL NUTRIENT CYCLING IN UPLAND PIEDMONT FOREST,
Forest Service (USDA), Research Triangle Park, N.C. Forest Science Lab.
C. Wells, D. Whigham, and H. Leith.
J Elisha Mitchell Sci Soc. Vol 88, No (2), p 66-78, 1972. Illus.
Identifiers: Forests, Hardwood, Litterfall, Loblolly, Minerals, *Nutrient cycling (Minerals), *Piedmont forests, Pines, Precipitation, Stemflow, Throughfall.

Nutrient cycling was investigated in a mixed hardwood and a natural loblolly pine stand. Measurements were made of the mineral element content of precipitation alone, throughfall, stemflow and litterfall. Total litterfall was 25% greater in the hardwood than in the pine. N and Ca in the litterfall were respectively 70 and 250% greater in the hardwood than in the pine. Hardwood litter contained about twice as much K, Mg, Mn, Cu, Na and Al as did the pine stand. More N, K, Ca and Mg was washed from the hardwood canopy trees than from the pine. A greater amount of K was contributed by throughfall than by litterfall.—Copyright 1973, Biological Abstracts, Inc.
W73-12700

VALUATION OF TIMBER, FORAGE AND WATER FROM NATIONAL FOREST LANDS,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.

For primary bibliographic entry see Field 06B.
W73-12701

COST CURVES FOR CROSS-DRAINAGE WORKS,
Government Coll. of Engineering, Aurangabad (India).
A. S. Tongaonkar.
Irrigation and Power, Vol 28, No 4, p 391-398, 1971. 7 fig, 2 tab.

Descriptors: *Cost analysis, *Canal construction, Conveyance structures, Graphical analysis, Construction costs, Aqueducts, Culverts.
Identifiers: *India (Maharashtra).

Either an aqueduct or culvert is required as a cross-drainage work to take a canal over a natural drainage. Because the cost of such a structure is dependent on many factors other than waterway availability, comparative cost analysis must provide decision criteria for site and structure selection. In addition, cost curves should corelate with canal and stream conditions. Cost curves for the Paithan Left Bank Canal of Jayakwadi Project Stage I (Godavari Project at Paithan, India) are constructed. In order to determine an appropriate means of corelating stream and canal conditions the relationship between barrel length of each culvert and cost of barrel was investigated and found to be linear. Total cost of culvert and barrel length generated a curve of initially steeper slope, thus indicating that structural items represent a large percentage of total cost and that total cost is directly related to total length of pipes. Total cost was linearly related to the waterway provided while the relationship between total cost and volume of the barrel traced a smooth curve. (Weaver-Wisconsin)
W73-12704

GROUND WATER MODELS WITH PARALLEL LINEAR RESERVOIRS,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 02F.
W73-12723

A SUGGESTED NEW APPROACH TO THE ANALYSIS OF DRAINAGE BASIN SHAPES,
Monash Univ., Clayton (Australia).
L. J. Hobba, and G. Robinson.
Area (Institute of British Geographers), Vol 4, No 4, p 242-251, 1972. 5 fig, 1 tab, 21 ref.

Descriptors: *Geomorphology, *Drainage patterns (Geologic), *Watersheds (Basins), *Terrain analysis, Topography, Valleys, *Australia.

Measures of the shape of drainage basins are reviewed and a new measure is suggested which takes into account all three dimensions of a basin. The shape indices which result are tested for a set of basins in Australia. The approach which is suggested involves the generalization of the three-dimensional form of the basin by the placement inside it of a framework of lines joining 'pivot' points within and on the perimeter of the individual catchment. The primary point A is located at the stream mouth. Point B is defined as the point where the main stream of the basin crosses the contour at which a $/A \pm 0.5$, where a and A are the areal measures used in the calculation of Strahler's hypsometric integral. G is a point projected vertically above B. Points C and D are fixed by the intersection of a line drawn perpendicular to AB through G and the basin perimeter. E is the point on the catchment circumference furthest distant in a straight line from A. (Knapp-USGS)
W73-12729

SOME EXAMPLES OF DRAINAGE COMPONENT ANALYSIS,
Malaya Univ., Kuala Lumpur (Malaysia).
R. P. C. Morgan.
Area (Institute of British Geographers), No 4, p 37-41, 1970. 2 fig, 1 tab, 6 ref.

Descriptors: *Geomorphology, *Hortons Law, *Drainage patterns (Geologic), Drainage density, Tributaries.
Identifiers: *Strahlers law, England, Malaysia.

First-order drainage components in third-order basins are analyzed in humid, vegetated conditions of southeast England and West Malaysia. That different environments result in different upper magnitudes is indicated by an analysis of comparing the components of the lower altitude slopes covered with rubber plantations with those of the steeper jungle covered terrain where local relief is greater. Second- order drainage develops more rapidly where the steeper slopes may be expected to produce greater surface runoff. Studies carried out in southeast England with environmental conditions of a local relief between 30 and 200 meters and hypsometric integrals around 30% show differences in the upper magnitudes attained by first-order components on three different rock types. On the Tunbridge Wells Sands, the frequency pattern reflects the presence of some very long first-order segments. The distribution pattern is interpreted in the light of the drying up of the valley heads following a fall in the water table. (Knapp-USGS)
W73-12734

A NOTE ON STREAM ORDERING,
University Coll. of Wales, Aberystwyth.
J. Lewin.
Area (Institute of British Geographers), No 2, p 32-35, 1970. 1 fig, 1 tab, 16 ref.

Descriptors: *Geomorphology, *Hortons law, *Drainage patterns (Geologic), Drainage density, Tributaries.
Identifiers: Shreves law.

The number of stream ordering procedures now available is such that it is more than ever necessary to decide on the best to use. Apart from the intrinsic elegance of the various quantitative relationships revealed, a practical criterion against which they may be judged is the degree to which order is proportional to stream status as manifested in size of catchment, number and lengths of contributing streams, stream discharge, or channel dimensions. An ordering system ought to relate to stream status unaffected by the way in which streams or links are combined together. Shreve's proposal to use simply the number of first-order links as an index of magnitude is most useful in this respect. To assess topological structure as well as magnitude, Shreve's magnitude system can be varied. (Streams above which are two links become second order, above which there are four links are third order, and so on.) The system is thus logarithmic. If the number of links or segments per order is then plotted on log graphpaper, A- and B-type networks appear contrasted. (Knapp-USGS)
W73-12735

THE SUPERIMPOSITION HYPOTHESIS FOR INCISED MEANDERS--A GENERAL REJECTON AND SPECIFIC TEST,
Makerere Univ., Kampala (Uganda).
For primary bibliographic entry see Field 02E.
W73-12736

CLIMATIC CHANGE AND ARRESTED MEANDER DEVELOPMENT ON THE RIVER SEVERN,
Wisconsin Univ., Madison.
G. H. Dury, C. A. Sinker, and D. J. Pannett.
Area (Institute of British Geographers), Vol 4, No 2, p 81-85, 1972. 1 fig, 17 ref.

Descriptors: *Geomorphology, *Valleys, *Meanders, *Topography, Glaciation, Pleistocene epoch, Terraces (Geologic), Drainage patterns (Geologic), Channel morphology, Paleoclimatology.
Identifiers: *Severn River (England).

The drainage of the upper Severn, England, has been strongly affected by a major climatic change. Some of its landforms are harmonious, others disharmonious with the climate of today. Stream shrinkage and channel filling occurred during the span 9000-8000 BP. A span of only 5,000 years included deglaciation, development of valley meanders, ingrowth of these meanders, and diminution of the streams to underfitness. The climatic events of this very brief interval impressed patterns that still survive in disharmony with the present climate. The geomorphic changes between large former and small present day meander traces and channel cross-sections, and between the associated spacing of pools and riffles exemplify step functions. Passage from step to step exemplifies the substitution of one quasi-equilibrium state for another. The contrast between the adjustment of channel cross-section and the adjustment of the long profile of the channel bed, as well as the lack of development of new stream meanders shows that some of the elements of channel morphology are out of phase with climatic changes. (Knapp-USGS)
W73-12737

EVALUATION OF HERBICIDES FOR SUBMERGED WEEDS IN CHAMBAL AND BHAKRA-NANGAL CANAL SYSTEMS,
Indian Grassland and Fodder Research Inst., Jhansi. Div. of Weed Ecology Control.
For primary bibliographic entry see Field 05G.
W73-12738

A PROPOSED STREAMFLOW DATA PROGRAM FOR CONNECTICUT,
Geological Survey, Hartford, Conn.
M. P. Thomas, and M. A. Cervione Jr.
Connecticut Water Resources Bulletin No 23, 1970. 18 p, 2 fig, 8 tab, 5 ref, append.

Descriptors: *Streamflow, *Project planning, *Connecticut, *Flow characteristics, Data collections, Programs, Water utilization, Water supply, Natural flow, Rivers, Streams, Regulated flow, Streamflow forecasting, Regression analysis, Hydrology, Hydrologic data, Gaging stations.

An evaluation of the streamflow data available in Connecticut was made to provide guidelines for planning future programs. Goals for a streamflow data program are identified with four classifications of streamflow data: (1) data for current use, (2) data for planning and design, (3) data to define long-term trends, and (4) data on stream environment. For principal streams draining more than 500 square miles, accuracy goals proposed for this classification of streamflow data are accuracy equivalent to that of a 25-year record, and for minor streams draining less than 500 square miles, accuracy equivalent to that of a 10-year record. The study shows that for all unregulated streams, goals relating streamflow characteristics to drainage basin characteristics. Long-term characteristics of flow in regulated streams will be determined by methods yet to be developed. (Woodard-USGS)
W73-12748

STAGE-DISCHARGE RELATIONS ON BIG LOST RIVER WITHIN NATIONAL REACTOR TESTING STATION, IDAHO,
Geological Survey, Idaho Falls, Idaho. Water Resources Div.
R. D. Lamke.
Open-file report IDO-22050, March 1969. 29 p, 30 fig, 7 ref.

Descriptors: *Stage-discharge relations, *Streamflow, *River forecasting, *Idaho, Theoretical anal-

ysis, Methodology, Rainfall-runoff relationships, Floods, Flood forecasting, Mathematical studies, Rating curves.
Identifiers: National Reactor Testing Station (Idaho).

Theoretical stage-discharge relations were computed for 11 selected sites on the Big Lost River system in Idaho within the National Reactor Testing Station. Rating curves were computed by various techniques, which are dependent upon the hydraulic characteristics of each site. Relative accuracies of the rating curves are shown by correlating curves of higher accuracy with curves of lower accuracy. The rating curves apply only for the stated conditions and for the physical and hydraulic characteristics existing in April 1968. After a large flood the curves could be considerably different because of erosion of the channels, dikes, and road embankments. Also, the curves for the culverts are for conditions of no debris at the entrances and in the barrels. Datum used is mean sea level. (Woodard-USGS)
W73-12750

THE BENTHIC FAUNA IN FOUR SMALL SOUTHERN APPALACHIAN STREAMS,
Georgia Univ., Athens. Dept. of Entomology.
For primary bibliographic entry see Field 02I.
W73-12784

CENCHRUS CILIARIS--A PERENNIAL PASTURE GRASS OF ARID AND SEMI-ARID AREAS,
Haryana Agricultural Univ., Hissar (India).
A. S. Faroda, and P. S. Tomer.
Indian Forester, Vol 97, No 12, p 675-680, December 1971. 50 ref.

Descriptors: *Forage grasses, *Pastures, *Forage palatability, *Drought resistance, *Soil conservation, Ranges, Arid climates, Semiarid climates, Plant growth, Soil-water-plant relationships, Planting management, Seeds, Application methods.

Cenchrus ciliaris is one of the dominant perennial grasses producing good quality forage in pastures and rangelands of arid and semiarid tracts. Its palatability tests have indicated that from preflowering stage till dead ripestage, it is comparable to other palatable grasses. It is widely adaptable grass native to tropical and South Africa, India and Indonesia, but now grown in Rhodesia, Uganda, Kenya, Somaliland, India, Tanganyika, Sudan, South Africa, Libya, U.A.R., Australia, and Pakistan. It provides excellent protection against soil erosion and checks the widening and deeping of gullies because of its soil binding capacity. Because of its adaptability to a wide range of soil and climatic conditions, it has a high degree of drought resistance, and extreme arid and humid conditions do not deter its growth. The most effective time for sowing this grass in arid and semiarid tracts is after the first effective rainfall. The seed rate varies with soil, rainfall and climatic conditions, with 2.25 kg seed per hectare sufficient for arid areas. Information is also given on spacing, mixtures, varieties, interculture, iver. (Gloyd-Arizona)
W73-12790

HIGH-ALTITUDE FORESTS AND GRASSLANDS OF MT. ALBERT EDWARD, NEW GUINEA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research.
K. Paijmans, and E. Loffler.
J Trop Geogr. 34, p 58-64, 1972, Illus.
Identifiers: Ferns, Fire, *Forests (High altitude), *Grasslands, *New Guinea (Mt. Albert Edward), Swamps, Topography, Trees.

The pattern emerging from the study of the Mt. Albert Edward area probably applies to most high mountains in New Guinea. A broad correlation is demonstrated between vegetation and topography and drainage, while superimposed on this is a haphazard burn pattern caused by irregular and patchy fires. The mountainsides and 70% of the summit plateau were formerly forested. Natural swamp grassland areas in the formerly glaciated section serve as fire nuclei within the forest. Tree fern savannas are a disclimax caused by fire in previously forested terrain. The study area and similar areas in New Guinea are gradually being impoverished by intensive burning and hunting, and there is an urgent need for conservation.--Copyright 1973, Biological Abstracts, Inc.
W73-12824

ESTIMATING SNOW-WATER EQUIVALENT FROM POINT-DENSITY MEASUREMENTS OF FOREST STANDS,
Canadian Forest Service, Edmonton (Alberta).
D. L. Golding, and R. L. Harlan.
Ecology. Vol 53, No 4, p 724-725, 1972, Illus.
Identifiers: Abies-lasiocarpa, Density, *Firs, *Forests, Measurements, Picea-engelmanii, Regression, Seasonality, *Snow, *Spruce fir, Trees.

To define the cumulative influence of adjacent trees on snow accumulation, the Bitterlich point-sampling technique was used with 4 angle sizes in an area of relatively homogeneous spruce-fir (Picea engelmanii-Abies lasiocarpa) with similar slope-aspect conditions. Snow-water equivalent at 50 points for 10 measurement dates was correlated with point density. Correlations were higher for that point density determined with angle 147.34 min than for the angles 73.66, 104.18, and 208.38 min. A linear regression model combining weighted point-density measurements using three angle sizes gave the highest correlations. There was a trend of increasing correlation from Jan. to April.--Copyright 1973, Biological Abstracts, Inc.
W73-12827

CONSIDERATIONS FOR EFFECTIVE SLOPING LAND DRAINAGE SYSTEMS,
Agricultural Research Service, Burlington, Vt. Soil and Water Conservation Research Div.
G. R. Benoit, and J. Bornstein.
Soil Sci Soc Am Proc. Vol 36, No 5, p 819-823. 1972. Illus.
Identifiers: Bypass, Climate, *Drainage systems, Equation, Flow, *Land drainage (Sloping), Seismograph analysis, Soils, Transpiration, Evapotranspiration, *Vermont, Water balance.

A 12-plot sloping land drainage study in East Franklin, Vermont, is located on a model Cabot silt loam-a poorly-drained glacial till fragipan soil. The plots consist of all combinations of 2 depths (30 and 51 cm) and 2 spacings (61 and 122 m) of surface drains (diversions) and 3 spacings (none, 30.5, and 61 m) of subsurface drains located 102 cm deep. Drainage, soil water, and climatic data were used to evaluate a water balance equation for each drain for 6 selected drainage intervals. A seismographic analysis showed vibrations in soil depth as related to bedrock configuration. The results showed great variation in drain performance between drains in the same interval and between intervals for the same drain. Wide differences observed between values for drainage plus soil water storage and rainfall minus potential evapotranspiration seemed to be related to initial soil water content, the gain or loss of soil water, and the magnitude of potential evapotranspiration. Greatest drainflow occurred from those subdrains located at points of shallowest soil depths with bypass flow occurring under the drains particularly during saturated conditions. A drainage system for wet sloping soil should include: surface drains for controlled removal of snowmelt surface runoff; subsurface drains located at the top of bedrock dropoffs, where the bedrock is closest to the soil surface; subsurface drains systematically spaced between these drains to intercept bypass flow before it reaches downslope soil surface areas.--Copyright 1973, Biological Abstracts, Inc.
W73-12933

PRELIMINARY FLOOD-FREQUENCY RELATIONS FOR SMALL STREAMS IN GEORGIA,
Geological Survey, Atlanta, Ga.
H. G. Golden.
Open-file report, April 1973. 29 p, 8 fig, 5 tab, 15 ref.

Descriptors: *Flood forecasting, *Flood frequency, *Flood peak, *Small watersheds, *Georgia, Hydrologic data, Regression analysis, Peak discharge, Streams, Streamflow, Mathematical studies, Equations, Climatic data, Topography, Geomorphology, Drainage area, Gaging stations, Flood control, Planning, Flood plains.

New flood information from 102 small basins (0.1 to 20 sq mi), not available for previous flood-frequency analyses, and data available from 120 larger drainage basins (20 to 1,000 sq mi) have been analyzed to provide planners and designers with preliminary relations for estimating the magnitude and frequency of flood peak discharges on small streams in Georgia. A program to collect and analyze flood peak data from small natural drainage basins was begun in 1963 by the U.S. Geological Survey in cooperation with the Department of Transportation of Georgia and the U.S. Department of Transportation. The Q2 (2-year flood) peak discharges were determined from flood-frequency curves for each of the small-stream stations. Multiple regression was used to define the relation between Q2 station data and selected physical and climatological basin characteristics. Statistically significant characteristics were drainage area, soils-infiltration-capacity index, and precipitation intensity. Equations were developed for three regions in the State, roughly delineated by three physiographic provinces. Equations for estimating Q50 (50-year flood) discharge were developed from the Q2 equations by the ratio method using the station flood-frequency data computed for the large stations. The equations are considered usable for any site in Georgia where the drainage area is between 0.1 and 20 sq mi and where the flood flow is virtually natural. The approximate standard error of estimate of the Q50 equation is 41% in Region I (Valley and Ridge and Blue Ridge Province), 48% in Region 2 (Piedmont Province), and 37% in Region 3 (Coastal Plain Province.) (Woodard-USGS)
W73-12946

MAYAK, RUSSIAN WILD RYEGRASS,
Department of Agriculture, Swift Current (Saskatchewan). Research Station.
T. Lawrence.
Can J Plant Sci. Vol 52, No 1, p 121-122. 1972.
Identifiers: Canada, Cultivars, Elymus junceus M, *Mayak, *Rye grass.

'Mayak' is the second cultivar of Russian wild ryegrass (Elymus junceus Fisch.) to be released by the research station at Swift Current, Saskatchewan, Canada.--Copyright 1972, Biological Abstracts, Inc.
W73-12974

4B. Groundwater Management

ANALYSIS OF SEEPAGE INTO GROUND-WATER SYSTEM,
Ife Univ. (Nigeria). Dept. of Agricultural Engineering.
A. A. Abiodun.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY7, p 1203-1208, July 1973. 8 fig, 7 ref, append.

Descriptors: *Seepage, *Recharge, *Groundwater movement, Infiltration, Canal seepage, Artificial recharge.

Analytical methods were developed to simulate seepage into a groundwater system from a range of geometries. The solutions to such problems might find practical application in situations where subsurface lateral distribution of seepage flows is to be restricted and also in cases where porous medium that is to be replenished is overlain by a fairly thin impermeable layer. The particular case chosen is that of seepage through a channel with impervious side walls and permeable bottom. The driving force of the flow system is the force of gravity and the flow is two-dimensional. The seepage flows are steady and fully saturated, taking place in an isotropic, homogeneous, porous medium, and Darcy's Law is applicable. The solution to this problem was obtained through the application of the hodograph technique. (Knapp-USGS)
W73-12412

ENVIRONMENTAL ISOTOPES AND CIRCULATION IN AQUIFERS UNDER VENICE (ISOTOPES DU MILIEU ET CIRCULATIONS DANS LES AQUIFERES DU SOUS-SOL VENITIEN),
Turin Univ. (Italy). Istituto di Geologia e Paleontologia.
For primary bibliographic entry see Field 02F.
W73-12419

SELECTED DATA ON WELLS IN THE BARSTOW AREA, MOJAVE RIVER BASIN, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
J. L. Hughes, and D. L. Patridge.
Open-file report, March 26, 1973. 102 p, 10 fig, 4 tab.

Descriptors: *Well data, *Water wells, *Aquifer characteristics, *Water quality, *California, Basic data collections, Hydrologic data, Water levels, Chemical analysis, Water analysis, Water utilization, Water level fluctuations.
Identifiers: *Barstow area (Calif).

In June 1971 the U.S. Geological Survey, in cooperation with the U.S. Marine Corps and the California Regional Water Quality Control Board, Lahontan Region, began an investigation of the degradation of groundwater in the Barstow area, Mojave River basin, California. The study area is in parts of the lower and middle Mojave River basin, San Bernardino County, an area of about 200 square miles. The principal towns are Barstow, Lenwood, and Daggett, with major Marine Corps Supply Centers at Nebo, Yermo, and Daggett. Industry includes the Marine Corps supply activities and the Atchison, Topeka, and Santa Fe Railway, with regional maintenance facilities in Barstow. This compilation makes available selected well records, water level measurements, and water quality data which will be useful in future water resources planning, and which will provide part of the basic data for a study of water quality degradation in the area. Wells are listed in numerical order by township, range, and section according to the well-numbering system used in California. For the most part, well data were obtained from records maintained by the Geological Survey and from visits by Geological Survey personnel to the wells and to well owners. (Woodard-USGS)
W73-12421

GEOHYDROLOGY OF THE DOVER AREA, DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 07C.
W73-12425

PHYSICAL CHARACTERISTICS OF BASALT AQUIFERS,
Washington State Water Research Center, Pullman.
J. W. Crosby, III, and J. C. Mellott.
Available from the National Technical Information Service as PB-222 284, $2.75 in paper copy, $1.45 in microfiche. Completion, Report June 1973. 5 p, 10 ref. OWRR A-021-WASH (2).

Descriptors: *Groundwater movement, *Basalts, Hydrogeology, Geophysics, *Electrical well logging, *Borehole geophysics, Aquifer characteristics, Logging (Recording).

Determination of certain physical characteristics of basalts which influence the transmission and storage of ground waters was accomplished, using borehole geophysical techniques and composite log interpretation practices. This research led to a number of larger research projects directed to geophysical studies of the basalts. By using digitized data from the geophysical logs an averaging technique was developed which permits the assigning of an effective permeability value to 20-foot vertical sections of the basalt. These effective permeabilities are used in computer models which evaluate the areal distribution of hydraulic potential in successive 20-foot vertical 'slices' through the basalt. Attempts to determine potential values on a hybrid computer through anology with Ohm's Law were not totally successful because of the limited storage capabilities, and ultimately the analysis was completed on the IBM-360 computer.
W73-12523

SURVEY OF INDUSTRIAL WASTE INJECTION WELLS, VOLUME II,
Missouri Univ., Rolla. Dept. of Geological Engineering.
For primary bibliographic entry see Field 05E.
W73-12576

GROUND-WATER RESOURCES, NELSON AND WALSH COUNTIES, NORTH DAKOTA,
Geological Survey, Grand Forks, N. Dak.
For primary bibliographic entry see Field 02F.
W73-12578

GEOLOGY OF NELSON AND WALSH COUNTIES, NORTH DAKOTA,
Geological Survey, Grand Forks, N. Dak.
For primary bibliographic entry see Field 02F.
W73-12579

PRESIDIO BOLSON, TRANS-PECOS TEXAS AND ADJACENT MEXICO: GEOLOGY OF A DESERT BASIN AQUIFER SYSTEM,
Texas Univ., Austin.
For primary bibliographic entry see Field 02F.
W73-12585

CONTROL OF UNDERSEEPAGE BY RELIEF WELLS, TROTTERS, MISSISSIPPI; APPENDIX K: 1969 PUMPING TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W73-12597

PUBLIC SUPPORT OF PRIVATE WATER RESOURCE DEVELOPMENT IN AGRICULTURE--WITH IMPLICATIONS FOR FIRM GROWTH,
Wyoming Agricultural Experiment Station, Laramie.
E. Olson, T. L. Dobbs, G. H. Pfeiffer, and G. Wedemeyer.
In: Annual meeting of Western Agricultural Economics Association, Commercial Agriculture--Management session, July 24, 1972, Logan Utah. 8 p, 3 tab, 5 ref. OWRR A-001-WYO (57) OWRR A-002-WYO (3).

Descriptors: *Water supply development, *Agriculture, *Financing, *Return (Monetary), Loans, *Wyoming, State governments, Interest, Investment, Appreciation, Sprinkler irrigation, Groundwater resources.
Identifiers: *Public financing, *Net return, Forage crops, Cash crops.

The State of Wyoming has been involved with support of private farm operators in adopting new technology for irrigation of agricultural lands through low-interest loans for center-pivot sprinkler systems. Most of these systems have facilitated the development of new underground water supplies. The results of the analysis concerning alternative methods of irrigation system financing, and the effects of State financed irrigation investments on the growth of farm firms are discussed. Data were collected from published research, secondary sources, and interviews. It was concluded that the State's support program was only partially successful in achieving its anticipated purposes. However, State financing, as compared to alternative means of financing, provided distinct advantages to investors. Thus, utilization of groundwater supplies by agriculture has proceeded at a more rapid rate than it otherwise would have. Except at the margin, it was found that investment in sprinklers for cash crop operations would have occurred in the absence of the State program; sprinkler investments result in net return and firm growth effects of considerable magnitude in production of cash crops such as sugarbeets and potatoes. Results for livestock operation were mixed. (Weaver-Wisconsin)
W73-12698

EVALUATION OF THE WATER RESOURCES OF LEMMON VALLEY, WASHOE COUNTY, NEVADA, WITH EMPHASIS ON EFFECTS OF GROUND-WATER DEVELOPMENT TO 1971,
Geological Survey, Reno, Nev.
J. R. Harrill.
Nevada Department of Conservation and Natural Resources Water Resources Bulletin No 42, 1973. 130 p, 13 fig, 27 tab, 21 ref, 2 append.

Descriptors: *Groundwater resources, *Water resources development, *Aquifer characteristics, *Water wells, *Nevada, Water supply, Pumping, Water yield, Groundwater recharge, Water utilization, Imported water, Water quality, Chemical analysis, Well data, Surface waters, Evaporation, Hydrology.
Identifiers: *Lemmon Valley (Nev).

This study, made in cooperation with Washoe County, City of Reno, and Nevada Department of Conservation and Natural Resources, reappraises the water resources of Lemmon Valley, a small valley of about 93 square miles north of Reno, Nevada. Intense faulting and fracturing associated with the Walker Lane fault zone have formed barriers to groundwater movement in the valley-fill reservoir and have created permeable zones in consolidated rocks which not only store water but also probably transmit some water out of the valley. Under natural conditions, recharge and discharge average about 1,400 acre-feet per year--about 900 in Silver Lake subarea and 500 in East Lemmon subarea. During 1971 about 900 acre-feet of imported water was used by about 2,700 persons living at Stead Facility (formerly Stead Air Force Base), including industrial use. As of September 1971, the State Engineer had issued permits to pump about 15,000 acre-feet per year in Lemmon Valley. If pumping is not strategically distributed with respect to the supply, local overdraft may develop even though no valley-wide overdraft exists. In 1971 the chemical quality of groundwater was acceptable for most uses. Exceptions to this are accumulations of naturally salty water beneath the playas in both subareas and some wells affected by local conditions. (Woodard-USGS)
W73-12718

HYDROGEOLOGY OF THE CARBONATE ROCKS, FREDERICK AND HAGERSTOWN VALLEYS, MARYLAND,
Geological Survey, Washington, D.C.
L. J. Nutter.
Maryland Geological Survey Report of Investigations No 19, 1973. 70 p, 26 fig, 2 plate, 8 tab, 51 ref, append.

Descriptors: *Groundwater resources, *Water wells, *Water supply, *Water quality, *Maryland, Aquifer characteristics, Hydrogeology, Well data, Water yield, Water level fluctuations, Pumping, Specific capacity, Water utilization, Groundwater recharge, Geochemistry, Chemical analysis.
Identifiers: *Frederick and Hagerstown Valleys (Md).

The Frederick and Hagerstown Valleys in western Maryland are underlain predominantly by Cambrian and Ordovician limestones and dolomites and contain many karst features (sinkholes, large springs, subsurface drainage, and closed depressions) characteristic of carbonate-rock terranes. Analysis of the water budget of a principal basin in Hagerstown Valley indicates that precipitation is about 35 inches, total runoff about 12 inches, and evapotranspiration about 23 inches. Hydrograph separation at three gaging stations in the Hagerstown Valley for 1967 showed that base flow (groundwater dishcarge) is about 80% of the total runoff. Topography is controlled largely by joints, faults, and bedding and is very useful for selecting well sites where high yielding wells are likely. Water wells in valleys have a median specific capacity of 1.0 gpm per ft compared with 0.09 gpm per ft for wells located on hilltops and upland areas. The hydraulic properties of carbonate rocks differ greatly from place to place. The transmissivity ranges from less than 10 to 31,000 square feet per day. The chemical quality of the groundwater is influenced by the mineralogy of the carbonate-rock aquifers. The water is hard or very hard, and the use of water softeners is fairly common. Nitrate concentration exceeded the limit recommended by the U.S. Public Health Service of 45 mg/liter in 37 of the 139 samples analyzed. (Woodard-USGS)
W73-12719

GROUND WATER MODELS WITH PARALLEL LINEAR RESERVOIRS,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 02F.
W73-12723

ARTIFICIAL RECHARGE OF GROUNDWATER AND INFILTRATION BASINS (ISKUSSTVENNOYE VOSPOLNENIYE ZAPASOV I INFIL'TRATSIONNYYE VODOZABORY PODZEMNYKH VOD),
V. S. Usenko.
Izdatel'stvo 'Nauka i Tekhnika', Minsk, 1972. 255 p.

Descriptors: *Artificial recharge, *Induced infiltration, *Groundwater recharge, *Groundwater, Water spreading, Water purification, Water pollution, Water quality, Filtration, Filters, Water chemistry, Chemical reactions, Physicochemical properties, Biological properties, Bacteria, Invertebrates, Algae, Water works, Lysimeters, Hydrogeology.
Identifiers: *USSR, *Germany, *Infiltration basins.

Artificial-recharge practice in the USSR and abroad, and physicochemical and biological principles of artificial groundwater recharge are discussed. Infiltration basins in the USSR and expecially in the two German Republics are described, and data are presented on their operation and efficiency. (Josefson-USGS)
W73-12745

COMPARISON OF WATERFLOOD CORROSION DETECTION AND MONITORING DEVICES,
Atlantic Richfield Co., Bakersfield, Calif.
For primary bibliographic entry see Field 08G.
W73-12757

SIMPLIFIED SOLUTION FOR DECREASING FLOW IN WELLS,
California Univ., Davis. Dept. of Irrigation.
For primary bibliographic entry see Field 08B.
W73-12759

SAND CONTROL - 3. CHEMICAL CONSOLIDATION,
Standard Oil Co. of California, San Francisco.
For primary bibliographic entry see Field 08G.
W73-12760

HERE'S A NEW SAND PACK METHOD,
Halliburton Services, Tulsa, Okla.
For primary bibliographic entry see Field 08G.
W73-12761

MICELLAR SOLUTIONS STIMULATE WELLS,
Amoco Production Co., Tulsa, Okla.
For primary bibliographic entry see Field 08B.
W73-12762

LEACHING OF CEMENT FROM A CONCRETE PILE SECTION BY GROUNDWATER FLOW,
Cementation Co. Ltd., London (England).
For primary bibliographic entry see Field 08F.
W73-12766

CORROSION MONITORING METHOD REDUCES EFFECT OF VARIABLES IN ANALYZING OIL FIELD WATERS,
Texaco, Inc., Bellaire, Tex. Bellaire Research Labs.
For primary bibliographic entry see Field 08G.
W73-12767

PROBLEMS OF GROUNDWATER POLLUTION BY BRINE,
Public Health Service, Dallas, Tex. Region VII.
For primary bibliographic entry see Field 05B.
W73-12770

RATIONAL DESIGN OF WELL SCREENS,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
For primary bibliographic entry see Field 08B.
W73-12771

PITLESS UNITS AND ADAPTERS,
Environmental Protection Agency, Washington, D.C. Div. of Water Supply.
For primary bibliographic entry see Field 08G.
W73-12776

WATER LEVELS NEAR A WELL DISCHARGING FROM AN UNCONFINED AQUIFER,
Geological Survey, Washington, D.C.
I. Remson, S. S. NcNeary, and J. R. Randolph.
Water Supply Paper 1536-B, p 27-39, 1961. 10 fig, 2 tab, 9 ref.

Descriptors: *Wells, *Aquifer characteristics, Analytical techniques, Equations, Hydrologic data, *Drawdown, Hydraulics.
Identifiers: Unsaturated flow, *Unconfined saturated flow, *Unsteady radial flow.

The differential equation describing unsteady radial flow to a well in an unconfined aquifer has no simple solution in terms of elementary functions because the transmissibility decreases as the aquifer is dewatered. A numerical solution and type curves are presented showing the head of water in a homogeneous aquifer as a function of radial distance from the well and time elapsed after the water level in the well is lowered to and maintained at a given level. This solution is similar to one presented by J. R. Phillip in 1955 for linear diffusion in a flow system in which diffusivity is concentration dependent. (Campbell-NWWA)
W73-12777

WASTE DISPOSAL WELL PERFORMANCE,
Monsanto Biodize Systems, Inc., Great Neck, N.Y.
For primary bibliographic entry see Field 05E.
W73-12779

THE DESIGN AND OPERATION OF DEEP-WELL DISPOSAL SYSTEM,
Chemstrand Corp., Pensacola, Fla. Utilities Assistance Group.
For primary bibliographic entry see Field 05E.
W73-12780

THE DISPOSAL OF WASTEWATER UNDERGROUND,
For primary bibliographic entry see Field 05E.
W73-12781

POLIOVIRUS IN A WATER SUPPLY,
Michigan Dpt. of Public Health, Lansing. Bureau of Environmental Health.
For primary bibliographic entry see Field 05B.
W73-12922

SALT POLLUTION OF A SHALLOW AQUIFER--INDIANAPOLIS, INDIANA,
Indiana State Univ., Terre Haute. Dept. of Geography and Geology.
For primary bibliographic entry see Field 05B.
W73-12940

EVALUATION OF A SHALLOW LEAKY WATER TABLE AQUIFER IN A SUBHUMID REGION OF FRANCE,
For primary bibliographic entry see Field 02F.
W73-12941

FLOW TO WELLS NEAR STREAMS IN THE PRESENCE OF DELAYED YIELD FROM STORAGE AND ANALYSIS OF PUMPING TEST DATA,
Bulgarian Academy of Sciences, Sofia. Geological Inst.
I. G. Yotov.
Ground Water, Vol 11, No 4, p 42-45, July-August 1973. 3 fig, 1 tab, 8 ref.

Descriptors: *Surface-groundwater relationships, *Water yield, *Storage coefficient, *Groundwater movement, *Drawdown, Laplaces equation, Induced infiltration, Equations, Specific yield, Hydrogeology.

Drawdown around pumping wells in aquifers near streams was calculated, including the effect of delayed yield from storage, using the image theory. Two methods are presented for determining the aquifer constants. The first method is based on the type curves for the initial moments of pumping and for later ones. The Carson-Laplace transforms of drawdown field data are required for applying the other method. A field example is used for illustration. (Knapp-USGS)
W73-12943

HYDRAULICS OF SHEETLIKE SOLUTION CAVITIES,
Geological Survey, Bay St. Louis, Miss. Gulf Coast Hydroscience Center.

G. K. Moore.
Ground Water, Vol 11, No 4, p 4-11, July-August 1973. 9 fig, 10 ref.

Descriptors: *Hydrogeology, *Karst hydrology, *Limestones, *Tennessee, Fractures (Geologic), Laminar flow, Groundwater movement, Hydraulics, Hydrodynamics, Aquifer testing, Darcys law, Theis equation, Aquifer characteristics.

The sheetlike solution cavities that supply water to most wells in central Tennessee are 100 to 2,500 feet wide and less than 0.2 inch high. These dimensions have a scale similar to those in Hele-Shaw models. Both logical and mathematical evidence indicate laminar groundwater flow, except close to pumping wells. The Theis nonequilibrium formula may be used to analyze aquifer-test data and to calculate significant values for transmissivity and storage. The Navier-Stokes equation and the Darcy equation for steady-state conditions may be used to estimate cavity dimensions. (Knapp-USGS)
W73-12944

SOURCES OF DATA FOR EVALUATION OF SELECTED GEOTHERMAL AREAS IN NORTHERN AND CENTRAL NEVADA,
Geological Survey, Menlo Park, Calif.
F. H. Olmsted, P. A. Glancy, J. R. Harrill, F. E. Rush, and A. S. Van Denburgh.
Open-file Report, April 1973. 78 p, 1 fig, 277 ref.

Descriptors: *Geothermal studies, *Nevada, *Information retrieval, *Publications, Heat flow, Geophysics, Geochemistry, Geology, Thermal water, Thermal properties, Thermal springs, Natural resources, Water temperature, Chemical analysis, Mineralogy.
Identifiers: Sources of data, Geothermal areas (Nev).

Sources of published and unpublished data are listed for areas in northern and central Nevada selected on the basis of geologic, geophysical, geochemical, and heat-flow evidence as being the most promising for the development of geothermal resources. Each geothermal area consists of one or more hydrographic areas, as defined by the office of the Nevada State Engineer and the U.S. Geological Survey (Scott and others, 1971), and contains one or more major hydrothermal discharge outlets. Not all place names in the report are shown on the map in the pocket; those not shown may be found in the references cited. The data categories are those required to define the geothermal reservoir parameters (boundaries, effective porosity, intrinsic permeability, specific storage, and chemical and mineralogical composition of rocks), fluid and temperature parameters, and sources and rates of input and output of heat and fluid. (Woodard-USGS)
W73-12947

HYDROLOGIC RECORDS FOR LAKE COUNTY, FLORIDA: 1971-72,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02E.
W73-12949

SOLUBLE SILICA AND FLUORIDE IN SOME SURFACE AND GROUND WATERS OF MYSORE STATE,
University of Agricultural Sciences, Bangalore (India). Dept. of Chemistry and Soils.
For primary bibliographic entry see Field 02K.
W73-12969

4C. Effects on Water of Man's Non-Water Activities

OUTDOOR RECREATION IN THE BALTIMORE AREA.
Regional Planning Council, Baltimore, Md.
For primary bibliographic entry see Field 06D.
W73-12360

THE LAKEFRONT PLAN OF CHICAGO.
Chicago, Ill.

December 1972. 49 p, 15 fig, 3 tab.

Descriptors: *Planning, *Recreation, Landfill, *Land use, Water quality, aesthetics, Parks, Coordination, *City planning, *Illinois.
Identifiers: *Lakefront development, Development policies, Land use controls, *Chicago.

The Chicago lakefront has been a significant area for recreational and cultural activities and of natural and man-made beauty for over fifty years. Policies and planning concepts for the maintenance and further development of the lakefront areas are presented. A short history of the development of the lakefront which was largely based on landfill projects, a discussion of basic development policies for the lakefront, a graphic presentation of possible planning alternatives for future development which include significant new landfills, and a strategy for implementing the new plans and projects are included. Strategy consists of adopting lakefront policies, conducting further studies and analyses of the area, programming various public improvements, promoting citizen participation, and establishing lakefront controls and ordinances. Some of the development policies relate to improving water quality and ecological balance, preserving cultural and historical heritage, increasing recreational diversity, preventing erosion, improving access, and coordinating public and private development. Numerous colorful maps and photographs are included. (Elfers - North Carolina)
W73-12367

BUFFALO CREEK DAM DISASTER: WHY IT HAPPENED,
Geological Survey, Arlington, Va.
W. E. Davies.
Civil Engineering ASCE, Vol 43, No 7, p 69-72, July 1973. 1 fig, 2 photo.

Descriptors: *Waste dumps, *Dam failure, *West Virginia, *Floods, *Coal mine wastes, Disasters, Foundation failure, Dam design, Soil mechanics.
Identifiers: *Buffalo Creek (W Va).

On February 26, 1972, a large coal refuse bank serving as a dam for a settling pool failed, resulting in a flash flood on Buffalo Creek, West Virginia. 125 persons were killed and $50 million damage was done. The refuse dam was built in 1969 by the Buffalo Mining Company, a subsidiary of Pittston Corporation. The causes of failure were inadequate foundations, lack of zoning and compaction in the structure, inadequate water-level control facilities, and lack of collars and baffles on an overflow pipe allowing water to penetrate deep within the structure. Some of the underlying causes that allowed these conditions to exist were lack of clear-cut laws and regulations at Federal and State levels; failure to enforce the State registration act as it applied to the practice of engineering; lack of planning, zoning, and engineering expertise at the county level; and failure of professions that had demonstrated competency in determining stability of refuse dams to apply their knowledge. (Knapp-USGS)
W73-12411

CALIFORNIA POWER PLANT SITING STUDY: VOLUMES, I, II, AND III.
Holmes and Narver, Inc., Anaheim, Calif.
For primary bibliographic entry see Field 05G.
W73-12574

RIVER CHANNEL CHANGE WITH TIME: AN EXAMPLE,
Geological Survey, Berkeley, Calif.
For primary bibliographic entry see Field 02J.
W73-12590

SEDIMENT RESULTING FROM CONSTRUCTION OF AN INTERSTATE HIGHWAY IN THE PIEDMONT AREA OF NORTH CAROLINA,
Geological Survey, Raleigh, N.C.
H. E. Reeder.
Open-file report, 1973. 27 p, 12 fig, 3 tab, 2 ref.

Descriptors: *Sediment transport, *Road construction, *Sediment control, *Settling basins, *North Carolina, Technology, Sediments, Particle size, Sedimentation, Erosion control, Vegetation, Methodology.

From July 1971 to August 1972 the U.S. Geological Survey, in cooperation with the North Carolina State Highway Commission, used a small settling basin in conducting a study of sediment runoff resulting from the construction of a segment of Interstate 40 in northwestern Wake County. A settling basin was constructed as part of the highway construction project directly downstream from the highway culverts. The depth of the basin varied from about 3-1/2 to 5 feet. The initial capacity of the basin at the top of the spillway was 720 cubic yards. A 4-inch drop outlet pipe was placed through the dam to provide discharge from the reservoir. Near the peak of a storm on July 31, sediment concentration of the inflow from the waste area was 7,050 mg/liter. At the same time, the concentration was 1,170 mg/liter in the lateral culvert which drains an area where grass cover was well established. The retention capacity of the settling basin was almost depleted, which allowed about 50% of the sediment entering the basin to pass on through the basin. At approximately the same time that inflow samples were collected, concentrations in the spillway and outflow pipe were 2,920 and 2,520 mg/liter, respectively. (Woodard-USGS)
W73-12713

FISHES OF THE BIG SOUTH FORK OF THE CUMBERLAND RIVER,
Tennessee Univ., Knoxville.
C. E. Comiskey, and D. A. Etnier.
J Tenn Acad Sci. Vol 47, No 4, p 140-146, 1972, Illus.
Identifiers: Etheostoma-kennicotti, Etheostoma-sagitta, Fish, Records, River, *Tennessee (Cumberland River), *Fish migration, *Railroad construction.

A recent survey of the fishes of the Big South Fork of the Cumberland River has confirmed the continued presence of 40 of the 50 spp. previously reported from the system. An additional 27 spp. are reported from the system for the first time. Evidence concerning the recent transfer of Etheostoma kennicotti (Putnam) and E. sagitta (Jordan and Swain) from the upper Cumberland River system (above Cumberland Falls) due to railroad grade construction in the vicinity of Stearns, McCreary County, Kentucky, is discussed. Additional comments concern the apparent transfer of a number of species from more westerly tributaries of the Cumberland River into several western tributaries of the Big South Fork in recent times by way of primarily underground drainage systems in Elk Springs Valley, Wayne County, Kentucky.–Copyright 1973, Biological Abstracts, Inc.
W73-12820

4D. Watershed Protection

SIXTEENTH ANNUAL ARIZONA WATERSHED SYMPOSIUM PROCEEDINGS.
Arizona Water Commission, Phoenix.

Symposium held at Phoenix, Arizona, Deptember 20, 1972. Arizona Water Commission Report No. 2 (1972) 43 p.

Descriptors: *Watershed management, *Wildlife habitats, *Aesthetics, Wildlife management, Landscaping, *Arizona, Southwest US.

The watershed's prime role is changing to that of a vast playground while population growth encroaches and reduces the available resource base. Watershed productivity and carrying capacity on remaining lands must be increased to meet these new pressures and demands while sustaining yields of traditional products. Research has shown that watershed management can increase productivity to meet these demands without violating environmental constraints; the papers presented are representative of this research. Topics include wildlife habitat improvement, aesthetics, and landscaping. (See W73-12404 thru W73-12408)
W73-12403

WILDLIFE HABITAT IMPROVEMENT IN RELATION TO WATERSHED MANAGEMENT IN THE SOUTHWEST,
Forest Service (USDA), Tempe, Ariz. Forest Hydrology Lab.
H. G. Reynolds.
In: 16th Annual Arizona Watershed Symposium Proceedings, September 20, 1972, Phoenix, Arizona, (1972) p 10-17. 5 fig, 50 ref.

Descriptors: *Wildlife habitats, *Wildlife management, *Watershed management, *Habitat improvement, *Competing uses, *Arizona, Cost-benefit analysis, Ponderosa pine trees, Pinyon pine trees, Juniper trees, Chaparral, Riparian land, Forest watersheds, Environmental effects.
Identifiers: Beaver Creek Pilot Watershed Project (Ariz.).

The interaction of ecological factors with social constrainst of laws and customs, together with economic limitations of costs vs. benefits, as this interaction bears on wildlife habitat at improvement in conflict with watershed management is discussed. It is desirable to understand how alteration of a vegetation complex by activities such as cutting or burning influences resident wildlife species, so that management practices can be developed compatible with multiple use of watershed. Ponderosa pine, pinyon-juniper, chaparral, and riparian habitats are discussed, with attention given to various means of modifying them to increase water yield. The effectiveness of wildlife habitat management practices depends not only upon detailed ecological knowledge, but its coordination with the needs and objectives of society as tempered by economic limitations. Nevertheless constraints are recommended to improve and enhance wildlife habitat when vegetation is being altered to improve water yield. Not only is it necessary to consider these but their employment will actually create more productive watersheds. (See also W73-12403) Paylore-Arizona)
W73-12404

RESPONSES OD DEER AND ELK TO BEAVER CREEK WATERSHED TREATMENTS,
Arizona Game and Fish Dept., Flagstaff.
D. J. Neff.
In: 16th Annual Arizona Watershed Symposium Proceedings, September 20, 1972, Phoenix Arizona (1972), p 18-24. 7 fig.

Descriptors: *Wildlife habitats, *Watershed management, *Habitat improvement, *Wildlife management, *Big game, Deer, Forest watersheds, Demonstration watersheds, Ponderosa Pine trees, Juniper trees, Pinyon trees, Oak trees, Clear-cutting, *Arizona.
Identifiers: Pellet group counts, Beaver Creek Pilot Watershed Project (Ariz.), Elk.

Research studies on the Beaver Creek watersheds in central Arizona to observe and evaluate responses of deer and elk to experimental vegetation treatments by pellet group counts show that in pinyon-juniper type habitat treatment plans should be conservative, keeping cleared areas relatively small and well interspersed with standing juniper cover. Productivity of tall brose plants should be protected, as well as highly palatable forbs and half-shrubs. One experimental watershed in the study lost its total forage cover by heavy experimental application of herbicides. In the ponderosa pine type habitat, logging management systems that open up small clear-cut spots or strips in pine forest canopy appear to be generally favorable to deer and elk. Gambel oak provides highly palatable browse and should be given high priority for its wildlife values. Stands of relatively rare tree and shrub species of special wildlife or esthetic value should be given consideration in logging or watershed management plans. Pine stringers that extend down along drainageways into grassland or juniper have great value as travel lanes and feeding areas for big game far out of proportion to the acreage and number of trees involved and should therefore, be given high priority for wildlife habitat. A series of figures for 16 experimental watersheds in the area show mean annual deer use by pellet groups per acre per month on clear cut windrowed, untreated, one-third clear-cut irregular strips, cabled, or felled. (See also W73-12403) (Paylore-Arizona)
W73-12405

A TREATMENT PRESCRIPTION FOR IMPROVING BIG GAME HABITAT IN PONDEROSA PINE FORESTS,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
W. P. Clary.
In: 16th Annual Arizona Watershed Symposium Proceedings, September 20, 1972, p 25-28. 1 fig, 8 ref.

Descriptors: *Wildlife habitats, *Big game, *Habitat improvement, *Watershed management, Ponderosa pine trees, *Demonstration watersheds, Projections, Forest watersheds, Water yield improvement, Small animals (Mammals), *Arizona.
Identifiers: Beaver Creek Pilot Watershed Project (Ariz.).

Using one of several experimental watersheds on the Beaver Creek watershed, central Arizona, this study will attempt to employ a number of techniques as applied to elk, deer, turkey, carnivores, small rodents, birds, and insects, to determine response to alterations in habitat. The prescription will be related to a series of treatment studies in the ponderosa pine types that include untreated controls, manipulation of timber overstory to increase water yield, livestock grazing to increase water yield, and silvicultural management to improve timber yield. Wildlife evaluations are included in most of these treatment studies. The intent of this particular one is to improve habitat for big game, but a number of constraints are imposed in the prescription to minimize the impact of these management procedures on smaller forms of wildlife. Computer models will be used to determine alternatives for management procedures designed to improve big game habitat, by insuring maintenance of maximum production and availability of wildlife feed without adverse effects on forest products and values. Results of this model will, it is expected, also provide evaluations of the hydrologic performance of the watershed, impact on sediment yields, initial and long-term effects on the timber resource, response of forage species important for both big game and livestock, and esthetic and recreational values of the treatment. (See also W73-12403) (Paylore-Arizona)
W73-12406

THE VISUAL ASPECTS OF RESOURCE MANAGEMENT,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
I. L. Fish.
In: 16th Annual Arizona Watershed Symposium Proceedings, September 20, 1972, Phoenix, Arizona (1972), p 29-37. 18 fig.

Descriptors: *Aesthetics, *Landscaping, *Scenery, *Land resources, *Watershed management, Environmental effects, Natural resources.
Identifiers: Perception.

The four dominant elements that characterize landscape: form, line, color, and texture, are applied to landscape management, which strives both for the utilitarian aspects of resource management programs as well as the potential visual opportunities of such programs, or, in a word, landscapes by intent, not accident. Temporary changes that constitute retrievable impacts on the visual landscape are differentiated from actions that cause irretrievable loss of non-renewable resources. Three concepts to recognize in dealing the landscape manipulation are its identifiable character, visually acceptable variety, and deviations that can be managed to achieve that variety. Criteria beyond the 4 dominant elements noted above include geological formations, vegetative arrangement or variety, water features (streams, lakes, waterfalls), and the existence of or lack of man's intrusions on the landscape. By following certainprinciples, the potential visual impact on the landscape of any management procedures can be portrayed and predicted in advance of activity. In watershed management programs particularly, the visual quality of the landscape can be controlled to the benefit of all. (See also W73-12403) (Paylore-Arizona)
W73-12407

MEASURING PUBLIC RESPONSES TO VEGETATIVE MANAGEMENT,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
R. S. Boster, and T. C. Daniel.
In: 16th Annual Arizona Watershed Symposium Proceedings, September 20, 1972, Phoenix, Arizona (1972), p 38-43. 5 fig, 1 tab, 9 ref.

Descriptors: *Aesthetics, *Vegetation effects, *Forest management, Public rights, *Landscaping, *Psychological aspects, Demonstration watersheds, Environmental effects, *Arizona.
Identifiers: Perception, Beaver Creek Pilot Watershed Project (Ariz.).

A set of criteria is presented that might be used to judge techniques designed to quantify scenic beauty, a new approach based on a systematic conceptual model supported by some recent research results from Arizona timberlands is described, and then the advantages of this approach are discussed in the context of the criteria. Criteria are that they be conducive to public involvement, independent of the tastes and preferences of the developers of the techniques, and statistically and mathematically unbiased; theoretically sound; capable of handling adequately uncertainties of judgments; easy to use, relatively inexpensive, valid, reliable, etc. Data from 6 Arizona ponderosa pine watersheds were used, of which 5 represented a wide array of vegetative manipulations. Using the Theory of Signal Detection methodology, various groups were tested by means of randomized sequences of slides to determine if the subjects

could consistently detect vegetative treatments. The TSD provides a means of achieving unbiased perceptual indices, is easy to use, fairly inexpensive, and provides more than simple ordinal information. This method of analysis ensures that outputs are unbiased by judgmental criteria, and that the perceived value is separated from standards. Its use is recommended in environmental design. (See also W73-12403) (Paylore-Arizona)
W73-12408

FINAL ENVIRONMENTAL STATEMENT: SMALL BEACH EROSION CONTROL PROJECT, BROADKILL BEACH, DELAWARE.
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 08B.
W73-12430

STONE AND WOODCHIP MULCHES FOR EROSION CONTROL ON CONSTRUCTION SITES,
Agricultural Research Service, Lafayette, Ind.
L. D. Meyer, C. B. Johnson, and G. R. Foster.
Journal of Soil and Water Conservation, Vol 27, No 6, p 264-269, Nov-Dec 1972. 4 fig, 4 tab, 12 ref.

Descriptors: *Mulching, *Erosion control, *Slope stabilization, Soil conservation, *Vegetation establishment, Erosion, Construction, Slopes, Wood wastes, Grasses, Bank stabilization, *Slope protection, Soil stabilization, Soil erosion, Sites, Bank protection, Construction materials.
Identifiers: *Mulches, Straw, Cut slopes, Construction practices, Construction methods.

An erosion study was conducted to compare several materials for use as mulches to control soil erosion on construction slopes. Crushed stone, gravel, and woodchip mulches showed great potential for erosion control on steep denuded slopes, especially where conventional methods might have been unsatisfactory. The effectiveness of the mulches in stabilizing the soil surface was a function of surface cover and mulch stability. Mulches costing much less than sodding were satisfactory slope stabilizers. Types and rates suited for different conditions are summarized. For 20% slopes tested, 100 to 200 tons/acre of stone or gravel or 15 to 25 tons/acre of woodchips provided excellent soil stabilization at reasonable cost on slope lengths up to about 150 ft. These results suggest that many construction slopes can be stabilized permanently immediately after they are shaped, and at reasonable cost. (USBR)
W73-12463

STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL IN NEW JERSEY.
For primary bibliographic entry see Field 02J.
W73-12956

CHANNEL EROSION SURVEYS ALONG PROPOSED TAPS ROUTE, ALASKA, JULY 1971,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 02J.
W73-12957

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

A NITROGEN CORRECTION FOR CALORIC VALUES,
Amsterdam Univ. (Netherlands). Lab. of Animal Physiology.
K. Kersting.
Limnology and Oceanography, Vol 17, No 4, p 643-644, 1972. 11 ref.

Descriptors: *Analytical techniques, *Nitrogen, *Productivity, Metabolism, Ammonia, Oxidation, Calibrations, Measurement.
Identifiers: *Calorimetry, Oxygen bomb calorimeter.

In production studies the oxygen bomb calorimeter has become an important tool. The fact that the reaction product of nitrogen compounds in the bomb differs from the biological reaction product is of concern to ecologists. In many aquatic organisms the main end product of nitrogen metabolism is ammonia; in oxygen bombs, however, the nitrogen is oxidized further. The extra energy obtained in this way has no biological meaning and a correction should be made accordingly. To compute this correction the end product of the nitrogen oxidation process in the bomb must be known. Determination of nitrates after the combustion of Daphnia magna in the Parr semimicro bomb gave results suggesting that when D. magna is bombed, the nitrogenous end product is, as would be generally expected, primarily N2. If so, a correction has to made for the reaction by which ammonia is oxidized to N2; the necessary energy can be calculated from the standard heats of formation. This correction is important, especially if caloric values of organisms with different nitrogen contents are compared. (Jones-Wisconsin)
W73-12383

AQUEOUS IRON-SULFUR SYSTEMS IN RICE FIELD SOILS OF LOUISIANA,
Alabama Univ., Birmingham. Inst. of Dental Research.
For primary bibliographic entry see Field 03F.
W73-12385

ALGAL BIOASSAYS: EXAMPLES, ADVANTAGES, AND LIMITATIONS OF CURRENT APPROACHES,
Environmental Protection Agency, San Francisco, Calif. Water Quality Office.
For primary bibliographic entry see Field 05C.
W73-12400

PCBS AND DDT,
Environmental Protection Agency, San Francisco, Calif. Water Quality Office.
For primary bibliographic entry see Field 05C.
W73-12402

THE EVALUATION OF EXISTING FIELD TEST KITS FOR DETERMINING FREE CHLORINE RESIDUALS IN AQUEOUS SOLUTIONS,
Army Medical Environmental Engineering Research Unit, Edgewood Arsenal, Md.
K. J. Guter, and W. J. Cooper.
Available from NTIS, Springfield, Va. 22151 as AD-752 440 - Price $3.00 printed copy; $1.45 microfiche. Report No 73-03, October 1972. 59 p, 7 fig, 23 tab, 31 ref, 5 append.

Descriptors: *Water analysis, *Chlorine, *Analytical techniques, Correlation analysis, Reviews, Evaluation, Chemical analysis, Aqueous solutions, Chlorination, Water treatment.
Identifiers: *Chlorine test kits.

An evaluation of five commercial test kit procedures which measure free available chlorine was conducted on both synthetic water (chemically treated distilled water) and five natural waters. Synthetic water samples were used to evaluate parameters influenced by temperature and pH. The ability of test kit procedures to differentiate free available chlorine from other previously reported chlorine test interfering ions, Mn and NO2, and the compounds monochloramine and dichloramine were also studied. The primary objective of the natural water studies was to evaluate the test kit procedures on a variety of natural waters that could be encountered around the world. Accuracy, precision and specificity for free available chlorine were evaluated with the natural water samples. The results led to a recommendation that procedural modifications be attempted in order to increase the specificity of the N,N-diethyl-p-phenylene diamine procedure and to improve the accuracy of the Syringaldazine (liquid) procedure, without adversely affecting their other qualities. (Woodard-USGS)
W73-12426

A TOPOLOGICALLY OPTIMUM RIVER SAMPLING PLAN FOR SOUTH CAROLINA,
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W73-12498

TRITIUM MEASUREMENT OF NATURAL WATERS ON OAHU, HAWAII: A PRELIMINARY INTERPRETATION (SAMPLING PERIOD: JULY 1969 TO JUNE 1970),
Hawaii Univ., Honolulu. Water Resources Research Center.
L. S. Lau, and T. H. Hufen.
Available from the National Technical Information Service as PB-222 279, $3.00 in paper copy, $1.45 in microfiche. Technical Report No. 65, May 1973. 39 p, 11 fig, 3 tab, 15 ref, 2 append. OWRR A-021-HI (1).

Descriptors: *Tritium, *Hawaii, Precipitation (Atmospheric), Surface waters, Groundwater, Isotopes, Measurement, Data collections, Data analysis.
Identifiers: *Oahu (Hawaii).

Water samples collected from various surface and sub-surface sources on the island of Oahu were analyzed for tritium levels. Tritium activity levels in twenty-five monthly rainwater samples show a seasonal dependence with a maximum in the summer (18.5 to 23 TU) and a minimum in the winter (12 TU). Samples from two surface-water reservoirs had activities of 13.2 and 19.7 TU reflecting contemporary rainwater which is their major source of recharge. Four streams in the Pearl Harbor area showed 'rainwater' tritium levels when sampled at high flow. At low flow, two of the streams had low tritium levels indicating ground-water discharge into the stream, while the tritium activity of the other two streams was comparable to rainwater. Tritium activity higher than that of contemporary rainwater (22-38 TU) was exhibited by samples from two springs which discharge perched water, while samples from three wells and two shafts in the Honolulu area showed very little or no tritium activity. Multiple-depth samples obtained from wells in the Pearl Harbor area showed correlations between tritium activities, depths of sampling, and chloride concentrations.
W73-12499

USE OF COLIPHAGES AS INDICATORS OF WATER POLLUTION,
New York Univ., N.Y. Dept. of Biology.
M. C. Hilton, and G. Stotzky.
Canadian Journal of Microbiology, Vol 19, No 6, p 747-751, June 1973. 2 fig, 2 tab, 15 ref.

Descriptors: *Water pollution sources, *Sewage, *Bacteriophage, *Bioindicators, Indicators, Parasitism, Bacteria, Coliforms, Municipal wastes, Hudson River, New York, Aquatic life, Bioassay, Water analysis, Pollutants, Testing procedures, Sampling, Rivers, Running waters, Sewage bacteria, Feasibility studies, *Pollutant identification.

The feasibility of using coliphages, obligate parasites of coliform bacteria, as indicators of water pollution by sewage was investigated. No consistent relationship was found between concentrations of coliform bacteria and coliphages in

samples from the Hudson River on the lower west side of Manhattan, New York. The results indicated, however, that a modification of the enrichment method for the detection of phages in soils and sewage could be used for detecting low levels of phages active against specific host bacteria. (Brown-IPC)
W73-12525

THE PROBLEM OF COLOR MEASUREMENT FOR PULP MANUFACTURING EFFLUENTS (LE PROBLEME DE LA MESURE DE COULEUR DES EFFLUENTS DE FABRICATION DES PATES),
Centre Technique de l'Industrie des Papeirs, Cartons et Celluloses, Grenoble (France).
For primary bibliographic entry see Field 05G.
W73-12526

PITFALLS AND PROCEDURES IN BOD TESTS,
MacMillan Bloedel Ltd., Vancouver (British Columbia).
W. E. Razzell.
Pulp and Paper Magazine of Canada, Vol 73, No 7, p 86-89 (p T186-189), July, 1972. 6 fig, 9 ref.

Descriptors: *Biochemical oxygen demand, *Pulp wastes, *Analytical techniques, Testing procedures, Water analysis, Waste waters (Pollution), Bioassay, Chemical analysis, Organic loading, Microorganisms, *Reviews.

A review of the literature on determinations of the BOD of diverse organic chemicals and of pulp mill wastes emphasizes the crucial importance of properly acclimated seed (i.e., mixed microbial flora) for successful short-term test results. Seed acclimation, leading to increased BOD values, avoids results which underestimate the chemical load of wastes and which could be refuted by additional tests with a more active seed. The use of BOD as a measure of waste discharges places a heavy burden on the analyst and requires an accumulation of data far beyond the routine analyses themselves. (Brown-IPC)
W73-12527

SETTLEABLE MATTER IN WASTE WATER. SCAN-W7:72.
Scandinavian Pulp, Paper and Board Testing Committee, Stockholm (Sweden).

Paperi ja Puu (Papper och Tra), Vol 54, No 1, p 11-12, January, 1972; reprinted in Norsk Skogindustri, Vol 26, No 2, p 47-48, February, 1972; and Svensk Papperstidning, Vol 75, No 4, p 143, February 29, 1972.

Descriptors: *Waste waters (Pollution), *Suspended solids, *Water analysis, Analytical techniques, Standards, Foreign countries, Europe, Pulp wastes.
Identifiers: *Scandinavia.

In this Scandinavian standard method for waste water characterization, a known volume of the shaken sample is allowed to settle, generally for 30 min, whereupon the supernatant is rfemoved by suction, and the remainder is filtered. The solid matter thus obtained is dried and weighed. Details of the procedure are given. (Brown-IPC)
W73-12530

DETERMINATION OF ORGANIC SUBSTANCES IN INDUSTRIAL EFFLUENTS (NEKTERE MOZNOSTI STANOVENI ORGANICKEHO ZNECISTENI ODPADNICH VOD),
IRAPA, Prague (Czechoslovakia).
S. Pokorny.
Papir a Celuloza (Prague), Vol 27, No 1, p 3-4, 12, 1972. 2 tab, 18 ref.

Descriptors: *Water analysis, *Pollutant identification, Waste waters (Pollution), Industrial wastes, Reviews, Testing procedures, Analytical techniques, Effluents, Pulp and paper industry, *Biochemical oxygen demand, Chemical oxygen demand, *Pulp wastes, Oxygen demand, Foreign research, Europe, Chemical analysis, Organic compounds.
Identifiers: *Czechoslovakia.

Various methods are outlined for the analytical determination of organic compounds in aqueous industrial wastes, especially pulp and paper mill effluents. Among determinations of biochemical oxygen demand, the classical five-day and respirometric procedures are compared. In measuring chemical oxygen demand by means of potassium permanganate or dichromate, a modified method developed specifically for use in the pulp and paper industry is discussed. (Trubacek-IPC)
W73-12532

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. II. TESTING METHODS,
Institute of Paper Chemistry, Appleton, Wis.
J. Weiner, and L. Roth.
Available from Institute of Paper Chemistry, Appleton, Wis., ($12.00), Bibliographic Series, No 252, 1972. 124 p, 394 ref.

Descriptors: *Water pollution, *Pulp and paper industry, *Bibliographies, *Testing procedures, *Monitoring, Water quality, Streams, Running waters, Chemical oxygen demand, Biochemical oxygen demand, Bioassay, Effluents, Industrial wastes, Pulp wastes, Pollutants, *Analytical techniques, Water analysis.

This second part of a six-part annotated and indexed bibliography deals with chemical and biochemical analytical and test methods for the identification and determination of pollutants in the aqueous effluent streams of pulp, paper, and board mills, as well as with the monitoring of water quality, the measurement of chemical and biochemical oxygen demand, and various bioassay procedures. The literature cited spans the publication period from about 1950 to 1970. (See also W73-12553). (Brown-IPC)
W73-12554

ENVIRONMENTAL IMPACT STUDY.
Ocean and Atmospheric Science, Inc., Dobbs Ferry, N.Y.
For primary bibliographic entry see Field 05G.
W73-12580

LEAD POLLUTION: RECORDS IN SOUTHERN CALIFORNIA COASTAL SEDIMENTS,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05B.
W73-12589

UPPER CHESAPEAKE BAY WATER QUALITY STUDIES, 1968-1971.
Environmental Protection Agency, Annapolis, Md. Field Office.

Data Report No 32, 1973. 31 p.

Descriptors: *Water analysis, *Water quality, *Chemical analysis, *Chesapeake Bay, Sampling, Analytical techniques, Inorganic compounds, Organic compounds, Water chemistry, Nutrients, Water temperature, Hydrogen ion concentration, Coliforms, Data collections, Sewage effluents, Pollutant identification, Water pollution sources.
Identifiers: *Upper Chesapeake Bay.

During the years 1967-71, various special surveys were conducted of the upper Chesapeake Bay and a number of its tributaries. The results of these investigations are presented. Bush River, Romney Creek, Spesutie Narrows and Swan Creek investigations have continued to determine the effects of the new Sod Run treatment plant on water quality and eutrophication. In the Chesapeake and Delaware Canal, studies were made of the effects of freshwater diversion from the Susquehanna River while work on the C and D Canal enlargement continued. Other studies were conducted on the Chester, Severn, Gunpowder, Middle, and Bird Rivers. Analytical methods and results are presented for the following parameters: water temperatures, light extinction, pH, conductivity, salinity, total phosphorus, inorganic phosphorus, total Kjeldahl nitrogen, nitrate + nitrite, ammonia, dissolved oxygen, biochemical oxygen demand, total organic carbon, total carbon, chlorophyll a, coliform, fecal coliform, and metals in solution. (Woodard-USGS)
W73-12601

HEAVY METALS IN THE ENVIRONMENT.
For primary bibliographic entry see Field 05B.
W73-12604

PROBLEMS IN THE ANALYSIS OF TRACE METALS,
Washington State Univ., Pullman. Nuclear Radiation Center.
R. H. Filby.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, p 59-79, January 1973. 16 tab, 18 ref.

Descriptors: *Pollutant identification, *Trace elements, *Chemical analysis, *Analytical techniques, Instrumentation, Sampling, Mass spectrometry, Polarographic analysis, Spectroscopy, Spectrophotometry, Heavy metals.

Trace element analysis is now a separate area of analytical chemistry, and many of the problems encountered are peculiar to the chemistry of very low concentrations. In the 1930's emission spectrography was used extensively for the determination of trace elements in many materials, and although the method proved to be a convenient and sensitive technique for many elements, it has been largely supplanted today by more precise and sensitive analytical methods. Some of the more important analytical methods in use today, and problems that may be encountered in determination of trace elements in environmental materials are summarized. Sample collection and chemical separation techniques are emphasized. (See also W73-12604) (Woodard-USGS)
W73-12608

TRANSPORT OF HEAVY METALS THROUGH THE AIR ENVIRONMENT,
California Inst. of Tech., Pasadena.
For primary bibliographic entry see Field 05B.
W73-12609

VARIABLE SAMPLING FREQUENCY - A NEW ADAPTIVE TECHNIQUE,
For primary bibliographic entry see Field 07B.
W73-12616

HEATED SENSORS FOR FLOW MEASUREMENTS,
For primary bibliographic entry see Field 07B.
W73-12618

FACTORS INFLUENCING DETECTION OF SALMONELLAE IN RENDERED ANIMAL BY--PRODUCTS,
Swift and Co., Oak Brook, Ill. Research and Development Center.
R. B. Tompkin, and T. V. Kueper.
Applied Microbiology, Vol 25, No 4, p 485-487, April 1973. 3 tab, 9 ref.

Descriptors: *Pollutant identification, Cultures, Feeds.
Identifiers: *Animal by-products, Enrichment, Culture media, Sample size.

The purpose was to develop a better understanding of the factors, such as enrichment and plating media and quantity of product tested, which influence the detection of salmonellae in naturally contaminated animal by-products. Two samples were analyzed for Salmonella, one with selenite-cystine broth and one by tetrathionate-Brilliant Green-iodine broth, both containing Tergitol No. 7. The enrichment broths were streaded onto plates of Brilliant Green-sulfa agar and Salmonella-Shigella agar. Salmonella-like structures were picked to triple sugar iron agar slants and tested serologically. The results confirm that a linear relationship exists between total plate counts and the detection of salmonellae in animal by-products in the total count range of 10,000 to 10,000,000 per gram. (Little-Battelle)
W73-12619

DEGRADATION OF METHYLMERCURY BY BACTERIA ISOLATED FROM ENVIRONMENTAL SAMPLES,
Midwest Research Inst. Kansas City, Mo.
W. J. Spangler, J. L. Spigarelli, J. M. Rose, R. S. Flippin, and H. H. Miller.
Applied Microbiology, Vol 25, No 4, p 488-493, April 1973, 1 fig, 5 tab, 7 ref.

Descriptors: *Microbial degradation, *Lake sediments, *Aquatic bacteria, *Aerobic conditions, *Anaerobic conditions, *Freshwater fish, Volatility, Radioactivity techniques, Biodegradation, Cultures, Isolation, Chemical analysis, Aquatic environment, Mercury, Heavy metals, Sampling, Methane.
Identifiers: *Methylmercury, *Demethylation, *Fate of pollutants, Biological magnification, Environmental samples, Lake St. Clair, Organomercury compounds, Electron capture gas chromatography, Flame ionization gas chromatography, Methylmercury iodide, Mercury radioisotopes, Hg-203, Methylmercury bromide.

In order to investigate the possibility that organisms capable of degrading methylmercury are present in the aquatic environment, 207 organisms which were isolated from sediments and fish were screened for demethylation of methylmercury bromide (MMB). Fish and sediment samples were also analyzed for total mercury and methylmercury. Each organisms to be tested for aerobic degradation was grown through 2 transfers in shaker flasks containing tryptic soy broth (TSB) without inorganic Hg or methylmercury. Hg-203-labeled MMB was added and each flask was connected to an HgBr sub 2-KBr trap containing a trapping solution to scavenge any inorganic Hg or organomercurials volatilized from the flask. Head gases were flushed to traps with a stream or vapor-saturated, sterile air. For anaerobic demethylation, 0 sub 2-free N sub 2 was used as the flushing gas, and 0.025 percent cysteine was added to the TSB. The trapped gas was monitored with a gamma scintillation spectrometer; methane in head gases was analyzed by flame ionization GC. Traps and flask contents were analyzed for MMB after extraction whereby methylmercury iodide was determined in benzene extracts by electron capture gas chromatography. Of the 207 bacterial cultures, 30 were found positive for aerobic demethylation. Twenty-two were shown to be facultative anaerobes and 21 degraded methylmercury anaerobically. All positive species volatilized methylmercury aerobically, and methane was produced as a degradation product. Although methylmercury degradation was complete in most cases, material balances indicated some of the inorganic mercury formed was not volatilized and is presumed bound to the cells. All positive isolates were tolerant to at least 0.5 microgram of methylmercury per ml, and the extent of volatilization of mercury increased with concentration to the threshold value. The results indicate that demethylating species are prevalent in the environment and may be important in suppressing the methylmercury content of sediments. (Holoman-Battelle)
W73-12620

SELECTIVE SUBSTRATE UTILIZATION BY MARINE HYDROCARBONOCLASTIC BACTERIA,
Naval Weapons Center, China Lake, Calif. Michelson Labs.
For primary bibliographic entry see Field 05B.
W73-12621

PREPARATION AND PROPERTIES OF 3--TRIFLUOROMETHYL-4-AMINOPHENOL,
Medical College of Wisconsin, Milwaukee. Dept. of Pharmacology.
For primary bibliographic entry see Field 05B.
W73-12622

THE ZOOPLANKTON OF THE GULF OF GUINEA,
V. Bainbridge.
Bulletins of Marine Ecology, Vol 8, No 1, p 61-97, September 1972. 13 fig, 7 tab, 72 ref.

Descriptors: *Zooplankton, *Sampling, *Atlantic Ocean, *Distribution patterns, *Migration patterns, Upwelling, Copepods, Vertical migration, Water temperature, Salinity, Diurnal distribution, Diel migration, Spatial distribution, Temporal distribution, Biorhythms, Africa.
Identifiers: *Species diversity, Sample preservation, Gulf of Guinea, Nigeria, Ghana, Cameroun, Senegal, Sierra Leone, Macroinvertebrates, Paracalanus spp., Eucalanus pileatus, Oncaea spp., Temora spp., Centropages spp., Oithona spp., Macrosetella spp., Corycaeus spp., Corycella garcillis, Acartia danae, Calocalanus spp., Undinula vulgaris, Copilia mirabilis.

The quantity and composition of the zooplankton in the coastal waters of tropical West Africa and its variability in relation to the hydrographic climate of the region are discussed. Three series of zooplankton collections were used: (a) samples taken with closing nets near the edge of the shelf off Guinea in October, 1956 and off Nigeria in 1961 and 1962 to investigate vertical distributions and migrations; (b) samples collected from July 1961 to July 1962 at the stations of a monitoring oceanographic transect off Lagos, Nigeria, to study the annual cycle of zooplankton; and (c) samples collected in 1952 during extensive fishery surveys along the West African shelf between Cape Verde and Fernando Po. All collections were preserved in 5 percent formaldehyde made up in filtered sea water and neutralized with borax. The results of the plankton analyses were considered in terms of community diversity and trophic structure. Zooplankton showed a marked discontinuity at the thermocline. Off Lagos in 1961 and 1962, quantities of zooplankton within the upper 30 m were normally low, showing a gradual transition from neritic to an oceanic fauna with increasing distance from the coast. During a weak upwelling in August and September, zooplankton volumes over the shelf increased fourfold or more. Two copepods, Calanoides carinatus and Eucalanus monachus, both relatively rare over the shelf during stable conditions, became abundant in the surface waters. During the upwelling, the faunal diversity declined and the percentage of carnivores in the population fell below the usual 20-40 percent level. Extensive surveys have confirmed the great ecological importance and frequent dominance of the copepod Calanoides carinatus during the localized upwellings off Ghana and Senegal where it would appear to be one of the main exploiters of the accompanying diatom blooms. The relevance of these studies to some well known concepts regarding speciation in tropical environments is discussed. The key factor leading to the usually highly diverse zooplankton appears to be relative stability of the environment. (Little-Battelle)
W73-12623

A STUDY OF INORGANIC SALTS REQUIREMENTS AND EFFECT ON THE MORPHOLOGY OF MARINE BACTERIA,
Georgetown Univ., Washington, D.C. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-12628

AN INTERDISCIPLINARY STUDY OF THE ESTUARINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS,
Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
E. F. Yost.
Available from the National Technical Information Service as N73-15346, $3.75 in paper copy, $1.45 in microfiche. Report Nos TR-20-1, NASA-CR-129936, December 1972. 47 p, 20 fig, 9 tab, 1 ref, append. Contract No NAS5-21792.

Descriptors: *Remote sensing, *Phytoplankton, *Water analysis, *Coasts, Water temperature, Salinity, Dissolved oxygen, Nutrients, Suspended solids, Optical properties, Chlorophyll, Silica, Pollutant identification, Phosphates, Nitrates, Nitrites, Organic matter, Aerial photography.
Identifiers: *Ground truth, Data interpretation, Chlorophyll a, Chlorophyll c, Block Island Sound, Multispectral photography.

The synoptic repetitive coverage of the multispectral imagery from the ERTS satellite, when photographically reprocessed using the state-of-the-art techniques, has given indication of spectral differences in Block Island and adjacent New England waters which were heretofore unknown. Of particular interest was the possible detection of relatively small amounts of phytoplankton prior to the occurrence of the red tide in Massachusetts waters. Preparation of spatial and temporal hydrographic charts using ERTS imagery and ground truth analysis should facilitate determining the environmental impact of New York coastal waters. Ground truths will be established by analyzing water samples for temperature, salinity, oxygen, nutrients, pigments, organics, phytoplankton, and optical properties. (Little-Battelle)
W73-12629

WATER QUALITY DETERMINATIONS IN THE VIRGIN ISLANDS FROM ERTS-A DATA,
Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
W. Egan.
Available from the National Technical Information Service as AD-754 009, $3.00 in paper copy, $1.45 in microfiche. Report No RM-561J, December 1972. 72 p, 13 fig, 7 tab, 9 ref.

Descriptors: *Water quality, *Remote sensing, *Aerial photography, *Aircraft, Sewage effluents, Sediments, Photometry, Virgin Islands, On-site investigations, Environmental effects, Pollutants, Thermal pollution, Water cooling, Chemical analysis, Water analysis, Ocean circulation, Optical properties, Turbidity, Dredging.
Identifiers: *Sensors, *Data interpretation, ERTS-A sensors, Multispectral sensing system.

The harbor at Charlotte Amalie on St. Thomas, Virgin Islands, has a concentration of many factors affecting water quality: untreated sewage effluent, sediment from navigation and dredging operations, runoff from a garbage dump, and hot effluent from a desalination/power plant. Imagery from ERTS-A in association with aircraft imagery and ground truthing permits the characterization of water quality in terms of absolute color values. This necessitates the establishment of photometric standards resolvable by the ERTS-A sensors in order that atmospheric effects, which generally vary on sequential overpasses, may be determined and subtracted. The overall program is described together with typical numerical results. (Holoman-Battelle)
W73-12630

FOULING ON EELGRASS (ZOSTERA MARINA L.),
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 05G.
W73-12631

THE CRAYFISH, ORCONECTES VIRILIS, AS AN INDICATOR OF MERCURY CONTAMINATION,
Canadian Wildlife Service, Edmonton (Alberta).
K. Vermeer.
Can Field Nat. Vol 86, No 2, p 123-125. 1972. Illus.
Identifiers: *Crayfish, *Indicators, *Mercury contamination, Orconectes-Virilis.

The crayfish, O. virilis, is a good indicator of mercury contamination in different water bodies. Crayfish muscle contained 3 times as much Hg as the remaining body. Hg levels did not differ significantly in samples collected from various parts of the shore of a highly contaminated lake.--Copyright 1973, Biological, Abstracts, Inc.
W73-12632

CONCENTRATION OF FLUORINE IN POTABLE WATER IN BIHAR PLATEAU: A PRELIMINARY SURVEY,
Indian Veterinary Research Inst., Izatnagar.
P. N. Johri, C. N. Singh, and J. P. Srivastava.
Indian J Anim Sci. Vol 41, No 6, p 452-455. 1971.
Identifiers: *Fluorine, *India (Bihar plateau), Plateau, *Potable water, Survey.

F-Concentration was estimated in 152 water samples collected from various sources. The F content of well water varied within the same village and was generally higher than other sources. Its concentration in water was higher in late winter than in rainy season. F in toxic levels was found in water samples of Ranchi, Hazaribagh and Palamau districts, India.--Copyright 1973, Biological Abstracts, Inc.
W73-12645

IDENTIFICATION AND MEASUREMENT OF ENVIRONMENTAL POLLUTANTS. SYMPOSIUM.

Ottawa, Ontario, Canada, June 14-17, 1971. National Research Council: Canada. 1971. 451 p. Illus. Maps.
Identifiers: Animals, Books, Chromatography, *Environmental pollutants, *Measurement, Pollutants, Symposium, *Pollutant identification.

This symposium was concerned with securing, devising, testing and adopting uniform, precise and accurate methods of analysis and to give official sanction to those techniques and procedures found acceptable for the identification and measurement of pollutants. All the invited symposium papers as well as the plenary lectures are presented. The first group of papers discuss the following: the need for environmental monitoring; evaluation of S and Se compounds as air pollutants; permeation tubes as primary gaseous standards; soil-pesticide interactions; and pesticide metabolism in animals. The next group of papers covers the following topics: analytical and organoleptic measurement of odors from animal wastes; determination of polychlorinated biphenyls in environmental samples; the problem of contaminants in human food; some recent developments in the chromatographic determination of multicomponent pesticide residues; and remote sensing techniques for oil slick measurements. The next section contains papers on the following topics: carbon analysis in pollution abatement; identification and measurement of trace elements in freshwater by neutron activation; P compounds in natural waters; and differentiation of chemical states of toxic species, especially cyanide and Cu, in water. The final group of papers describes the following related topics: tracer cosmos, a realistic concept in pollution analysis; monitoring of radioactive isotopes in environmental materials;fluoride in the environment; and man's reaction to his acoustical environment.--Copyright 1973, Biological Abstracts, Inc.
W73-12655

DETERMINATION OF MELAMINE-FORMALDEHYDE RESIN IN WHITE WATERS (OPREDELENIE SODERZHANIYA MELAMINO-FORMALDEGIDNOI SMOLY V PODSETOCHNYKH VODAKH),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti, Pravdinski (USSR).
G. B. Shtreis, M. V. Frolov, and Yu. G. Polikanov.
Bumazhnaya Promyshlennost, No 1, p 26, January, 1972. 1 fig, 2 tab.

Descriptors: *Water analysis, *Resins, *Pulp wastes, *Waste water (Pollution), Effluents, Testing procedures, Analytical techniques, Pollutants, Pulp and paper industry, Ultraviolet radiation, Spectrophotometry, Nitrogen compounds, Polymers, Additives, Retention, Chemical analysis.
Identifiers: *Melamine resins, Synthetic polymers, White water, Cellulose fibers, Melamine, Formaldehyde, Chemical retention, Pulp additives, Chemical consumption.

The efficiency of retention of melamine-formaldehyde resins by pulp fibers affects not only the sizing quality and wet strength of paper, but also the amounts lost in the paper machine waste water (white water) and thus the pollution load of the sewered effluent. A convenient and rapid procedure for determining resin retention is described. It is based on the absorption of ultraviolet light at 243 nm by the resin, followed by calculation of resin concentration in the white water. It gives analytical results which agree with those obtained by the more time-consuming Kjeldahl method to within plus or minus 5 per cent. (Stapinski-IPC)
W73-12672

EVALUATION OF THE WATER RESOURCES OF LEMMON VALLEY, WASHOE COUNTY, NEVADA, WITH EMPHASIS ON EFFECTS OF GROUND-WATER DEVELOPMENT TO 1971,
Geological Survey, Reno, Nev.
For primary bibliographic entry see Field 04B.
W73-12718

HYDROGEOLOGY OF THE CARBONATE ROCKS, FREDERICK AND HAGERSTOWN VALLEYS, MARYLAND,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-12719

WATER QUALITY IN THE MIDDLE FORK FEATHER RIVER, CALIFORNIA, MAY 1970 THROUGH SEPTEMBER 1971,
Geological Survey, Menlo Park, Calif. Water Resources Div.
A. E. Dong, and R. L. Tobin.
Open-file report, February 22, 1973. 55 p, 8 fig, 5 tab, 13 ref, 6 append.

Descriptors: *Water quality, *Wild rivers, *California, *Chemical analysis, Scenery, Rivers, Recreation, Sampling, Streamflow, Flow rates, Gaging stations, Baseline studies, Biota, On-site investigations, Laboratory tests, Data collections, Evaluation.
Identifiers: *Middle Fork Feather River (Calif).

A 69-mile reach of Middle Fork Feather River, California, has been designated as part of the National Wild and Scenic Rivers System. A multiagency water sampling and analysis program was undertaken to establish the quality of water in the river. Discharge in the river fluctuates in an annual pattern, high in winter and spring, low in summer, with wide differences from year to year. Water samples were collected at four gaging stations at monthly intervals to demonstrate diurnal fluctuations. Samples were collected at 37 sites along the reach to provide profiles of water quality at several times during the study. Samples were selectively analyzed in the field or in the laboratory for temperature, dissolved oxygen, specific conductance, pH, alkalinity, coliform bacteria, BOD, TOC, MBAS, color, nitrogen and phosphorus in various forms, sulfate, chloride, dissolved solids, turbidity, and suspended sediment. Water in Middle Fork Feather River is of good quality and meets most of the criteria for freshwater biota and recreational purposes. Water quality is poorest at the upstream end near Portola, and quality improves in the downstream direction, probably due to dilution by better quality water from tributaries. (Woodard-USGS)
W73-12720

PH-SENSITIVE FLUOROGENIC SPRAY REAGENTS: II. QUANTITATIVE STUDIES WITH PESTICIDES,
Dalhousie Univ., Halifax (Nova Scotia). Trace Analysis Research Centre.
R. W. Frei, and P. E. Belliveau.
Chromatographia. Vol 5, No 5, p 296-300. 1972. Illus.
Identifiers: Fluorogenic, *Pesticides, Quantitative methods, Spray reagents (Fluorometric), Hydrogen ion concentration.

A new spray using DDQ (1,2-dichloro-4,5-dicyanobenzoquinone) for the in situ fluorometric detection of sulfur-containing pesticides on thin-layer chromatograms was studied in order to evaluate the quantitative potential of the method. The effects of pH, various adsorbents, spray solvents and concentrations, U.V. irradiation and time on the fluorescent intensity of the spots were investigated and the optimum conditions were established. An average reproducibility of 5% relative standard deviation and an average detection limit of 0.05microgram/spot were obtained. Linear calibration curves up to 5 microgram/spot and extending through the point of origin were observed. This method was used successfully to analyze a natural water sample containing 2 ppb of malathion.--Copyright 1973, Biological Abstracts, Inc.
W73-12727

AUGER SOIL SAMPLER FOR HERBICIDE RESIDUES,
Agricultural Research Service, College Station, Tex. Plant Science Research Div.
For primary bibliographic entry see Field 02G.
W73-12794

SIMULTANEOUS DETECTION OF THE RESIDUES OF ATRAZINE AND LINURON IN WATER, SOIL, PLANT, AND ANIMAL SAMPLES BY THIN-LAYER CHROMATOGRAPHY,
Department of Agriculture, Ottawa (Ontario). Chemistry and Biology Research Inst.
R. Purkayastha.
Int J Environ Anal Chem. Vol 1, No 2, p 147-158, 1971, Illus.
Identifiers: *Atrazine, *Chromatography (Thin layer), Corn-M, *Herbicides, *Linuron, Residues, Samples, Soils.

The s-triazine and substituted urea herbicides are reviewed briefly, with particular reference to their extraction, clean-up, separation by thin-layer chromatography (TLC), and detection. A number of TLC systems were found for the complete separation of atrazine from linuron. On the chromatoplate both the silver nitrate spray followed by UV-irradiation, and the tert-butyl hypochlorites spray followed by iodidestarch can detect the herbicides in the submicrogram range. Under these experimental conditions acetonitril was the most useful extracting solvent. A detailed procedure for the simultaneous detection of atrazine and of linuron by TLC is given, which is applicable to samples of egg, blood, muscle, liver, corn plant, chicken feed, milk, soil, and water. The method is sensitive to 0.1 ppm or even lower with appropriate clean-up procedures. The thoroughness of the clean-up necessary depends on the nature of the sample. For this purpose, hexane partitioning, and chromatography on polyethylene-coated alumina, alumina, and Florisil have been used chiefly. Recovery of the 2 herbicides, using the above procedure, ranged from 80-92%.--Copyright 1972, Biological Abstracts, Inc.
W73-12811

MERCURY LEVELS IN WISCONSIN FISH AND WILDLIFE,
Wisconsin Dept. of Natural Resources, Madison.
S. J. Kleinert, and P. E. Degurse.
Wis Dep Nat Resour Tech Bull. 52, p 1-22, 1972, Illus.
Identifiers: Deer, Duck, *Fish, Goose, Grebe, Heron, *Mercury, Pheasant, Rabbit, Ruffed grouse, Squirrel, Swan, *Wildlife, *Wisconsin.

Mercury determinations were made on 1824 fish fillet samples representing 139 locations covering 52 of Wisconsin's 72 counties and boundary waters of Lake Michigan, Green Bay, Lake Superior, and the Mississippi River. All Wisconsin fish analyzed contained some Hg, and those from waters removed from any known source of Hg use averaged .19 ppm and ranged between .01-.60 ppm Hg. The highest levels, averaging about 1 ppm and ranging between .10-4.89 ppm, occurred in fish taken from sections of the Chippewa, Flambeau and Wisconsin Rivers located below paper mills and below a Hg cell chlorine-caustic soda plant. Different species vary in Hg content, and the larger fish often contain higher concentrations than do smaller fish of the same species taken from the same water. Fish samples taken from the following areas contained Hg levels averaging above the .5 ppm guideline established by the Food and Drug Administration for banning fish from interstate markets: the 350-mile stretch of the Wisconsin River below Rhinelander, 40 miles of the Flambeau River between Cedar Rapids and the junction with the Chippewa River, and 50 miles of the Chippewa River from the junction with the Flambeau River to Eau Claire. Hg determinations were made on 234 wildlife muscle samples and 220 wildlife liver samples. The common game species were sampled including deer, rabbits, squirrels, ruffed grouse, pheasants, puddle ducks, diving ducks and geese. Swans, pied-bill grebes and blue herons were also sampled. Hg levels of most Wisconsin wildlife was well below .5 ppm. Water birds, including waterfowl, contained more Hg than mammals or upland game birds. Livers of diving ducks, herons, and grebes approached or exceeded .5 ppm. No geographic locations were noted where Hg seemed to be more concentrated in wildlife.--Copyright 1972, Biological Abstracts, Inc.
W73-12812

LASER INDUCED FLUORESCENCE IN ALGAE: A NEW TECHNIQUE FOR REMOTE DETECTION,
Sparcom, Inc., Alexandria, Va.
E. J. Friedman, and G. D. Hickman.
Available from the National Technical Information Service as N73-12527. Report No. NASA-CR-62090, October 1972. 108 p, 37 fig, 3 tab, 4 append. Contract No. NASS-2081.

Descriptors: *Remote sensing, *Absorption, *Fluorescence, *Pigments, *Pollutant identification, *Chlorophyll, Chlorophyta, Electronic equipment, Mechanical equipment, Mathematical studies, Rhodophyta, Cyanophyta, Chlamydomonas, Chlorella.
Identifiers: Chlorophyll a, Laser-excited fluorescence, Porphyridium, Lasers, Agmenellum, Carotenoids, Phycobilin, Phycoerythrin, Phycocyanin, Fluorescence spectra.

Measurement of the absorption and fluorescence spectra were obtained for four types of marine and fresh water algae using a pulsed N2/Ne dye laser as the source of excitation. The algae investigated were Agmenellum, Chlorella, Chlamydomonas, and Porphyridium. The absorption maxima for the algae ranged from 420 to 675 nm while their fluorescent spectra ranged from 580 to 685 nm. It appears feasible that various algal species can be identified by detection of their fluorescent signatures using a tunable laser as the excitation source. However, if one is concerned only with detection of chlorophyll a, the optimum excitation is approximately 600 plus or minus 50 nm while detection is at 685 nm. An analysis of both calculations and laboratory results indicates that it should be feasible to measure chlorophyll a in concentrations as low as 1.9 mg/cu m using a 100 kw peak pulsed laser from an altitude of 500 meters. (Little-Battelle)
W73-12841

A COMPARISON OF LIQUID SCINTILLATION AND GEIGER-MULLER ESTIMATES OF PRIMARY PRODUCTIVITY IN AN IN SITU EXPERIMENT,
Manitoba Univ., Winnipeg. Dept. of Zoology.
F. J. Ward, and M. Nakanishi.
Journal of the Fisheries Research Board of Canada, Vol 30, No 5, p 708-711, May 1973. 1 fig, 1 tab, 6 ref.

Descriptors: *Primary productivity, *Radioactivity techniques, *On-site test, *Methodology, Incubation, Algae, Photosynthesis, Water analysis, Light intensity, Carbon dioxide, On-site date collections, On-site investigations.
Identifiers: *Liquid scintillation, *Geiger-Muller estimates, *Comparative studies, Method evaluation, C-14, Sample preparation, Scintillation counting, Shiozu Bay, Lake Biwa, Japan, Error sources.

For an in situ experiment conducted in Shiozu Bay, Lake Biwa, Japan, primary productivity estimates from liquid scintillation radioactivity counts of wet algae were generally higher than those from Geiger-Muller radioactivity counts of desiccated algae. Values at 0 m were similar, the G-M estimate at 0.5 m was 10 percent higher, but from 3 to 13 m the liquid scintillation values ranged from 11 to 33 percent higher than G-M estimates. The 20-m estimates were low and similar. Differences were caused primarily by C-14 losses during desiccation prior to G-M counting. Increasing loss rates between 0.5 and 3.0 m may have been caused by decreasing light intensity. On the basis of surface area, the estimate from liquid scintillation data was 27 percent greater than that obtained from G-M data. The results indicated that previously recommended methods for sample preparation and radioactivity determinations may cause primary productivity estimates from in situ data to be significantly in error. (Mortland-Battelle)
W73-12848

STEAM DISTILLATION: A SIMPLE TECHNIQUE FOR RECOVERY OF PETROLEUM HYDROCARBONS FROM TAINTED FISH,
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
R. G. Ackman, and D. Noble.
Journal of the Fisheries Research Board of Canada, Vol 30, No 5, p 711-724, May 1973. 1 fig, 1 tab, 17 ref.

Descriptors: Fish, *Separation techniques, *Methodology, Pollutant identification, Water pollution sources, Oil pollution, *Canada.
Identifiers: *Steam distiallation, Recovery, *Petroleum hydrocarbons, Sample preparation, Muscle, Diesel oil, Gas liquid chromatography, Flame ionization, Gas chromatography, Animal tissues, *Athabaska River (N.S.), *Whitefish.

Fish caught in the Athabaska River were filleted when required, blended with distilled water and transferred to a distillation flask along with flask washings. Antibumping granules were added and the fish muscle blend was simmered for 30 min before distillation to reduce foaming. Neohexane was added to the condensate in a centrifuge tube and shaken vigorously. The neohexane layer which was allowed to separate upon standing for 1 hr or less was analyzed by flame ionization chromatography using a support-coated open-tubular (SCOT) stainless steel column. Samples of diesel oil and fish obtained from a source apparently free from contamination were examined as controls. Simple steam distillation was found to be efficacious for isolation of hydrocarbons from contaminated whitefish. Gas-liquid chromatography on support-coated open-tubular Apiezon-L columns demonstrated that hydrocarbons recovered from the tainted fish had a composition pattern qualitatively similar in detail to that from a sample of diesel oil suspected as the source of contamination. (Holoman-Battelle)
W73-12849

ADDITIONAL STUDIES FOR THE SPECTROPHOTOMETRIC MEASUREMENT OF IODINE IN WATER.
Beckman Instruments, Inc., Fullerton, Calif. Advanced Technology Operations.

Available from the National Technical Information Service as N73-10172. Report Nos NASA-CR-128585, FR-1116-101, August 31, 1972. 37 p, 18 fig. NAS 9-12769.

Descriptors: *Spectrophotometry, *Iodine, *Pollutant identification, *Water analysis, Measurement, *Instrumentation, Automatic control, Turbidity, Chemical analysis, Aqueous solutions, Electronics, Automation, Halogens.
Identifiers: *Iodine-iodide spectroscopy, Automated iodine monitoring system, Chemical interference, Isosbestic point.

Previous work in iodine spectroscopy is briefly reviewed. Continued studies of the direct spectrophotometric determination of aqueous iodine complexed with potassium iodine show that free iodine is optimally determined at the isosbestic for these solutions. The effects on iodine determinations of turbidity and chemical substances (in trace amounts) are discussed and illustrated. At the levels tested, iodine measurements are not significantly altered by such substances. The main objective of the present work--a preliminary design for an on-line, automated iodine monitor with eventual capability of operating also as a controller--is

analyzed and developed in detail with respect to optics, mechanics, and circuitry. The resulting design features a single beam colorimeter operating at two wavelengths (using a rotating filter wheel). A flow-through sample cell allows the instrument to operate continuously, except for momentary stop flow when measurements are made. The timed automatic cycling of the system may be interrupted whenever desired, for manual operation. An analog output signal permits controlling an iodine generator. (Holoman-Battelle)
W73-12851

CHARACTERIZATION OF SWEET POTATO PROCESSING WASTES,
North Carolina State Univ., Raleigh.
B. W. Raines.
Available from--Univ. Microfilms, Inc., Ann Arbor, Mich. 48106. Order No. 73-1201. Ph D Dissertation, 1972. 78 p.

Descriptors: *Industrial wastes, *Food processing industry, *Sweet potatoes, Biochemical oxygen demand, Chemical oxygen demand, Carbohydrates, Cellulose, Lignins, Biodegradation, Carbon, Waste treatment, *Waste identification, *Pollutant identification.
Identifiers: Characterization, Sugars, Starches, Pectin gums, Mucillages, Hemicelluloses.

Characterization of liquid waste from sweet potato processing plants was conducted in three stages. These were: (1) A study of waste strength as defined by 5-day biochemical oxygen demand, chemical oxygen demand (COD) and total carbon (TC). (2) A study of the potential biodegradability of the waste via chemical determination of individual carbohydrate components. (3) A study of the effect of acclimated versus nonacclimated seed organisms on the biochemical oxgyen demand test. The 'readily biodegradable' carbohydrate of sweet potato waste constituted 88 percent of the total carbohydrate, dry weight basis and included sugars (17 percent), starch (56 percent) and pectin gums and mucillages (15 percent). Less 'readily biodegradable' carbohydrates were hemicelluloses (5 percent), cellulose (1 percent) and lignin (0.5 percent). The data demonstrated that substrate availability was not a limiting factor in the 5-day BOD method for sweet potato waste. duplicate analyses of acclimated seed versus unacclimated seed organisms on BOD revealed little difference in results when utilizing culture material obtained from aerated raw sewage and one grown under conditions experienced in the BOD test. 'Most probable numbers' reached 5 million/ml in one to two days then rapidly decreased to 300/ml at five days. Preliminary investigations indicated that nitrogen and/or phosphorus concentrations in the BOD analysis were limiting to bacterial growth and may explain the low BOD results. (Little-Battelle)
W73-12852

AROMATIC HYDROXYLATION AS AN ANALYTICAL REACTION,
Wisconsin Univ., Madison.
K. S. Albert.
Available from--Univ. Microfilms, Inc., Ann Arbor, Mich. 48106. Order No. 72-31,511. Ph D Dissertation, 1972. 169 p.

Descriptors: *Aqueous solutions, *Aromatic compounds, *Chemical reactions, *Chemical analysis.
Identifiers: *Hydroxylation, *Sample preparation, Cyclodextrin, Glucose, Calibration curves, Benzene, Chemical interference.

The Hamilton hydroxylating system, an aqueous solution of ferric ion, catechol, and hydrogen peroxide, hydroxylates aromatic compounds in aqueous solution. The further development and application of this system to the quantitative determination of some aromatic compounds are reported. By reducing the initial ratio of peroxide to aromatic to 2.0 or less, stable absorbance values were obtained, the yield depending upon the ratio. The instability of the initial hydroxylation product has been overcome by incorporating a 'stabilizer' in the reaction mixture. Two such modified Hamilton systems which were studied extensively are those of cyclodextrin at 25 degrees and glucose at 25 degrees and 75 degrees. Using the cyclodextrin-modified Hamilton system, many mono- and disubstituted benzene derivatives give linear absorbance-concentration responses in the range 0.0001-0.0008 M with apparent molar absorptivities between 1000 and 5000. The glucose-modified Hamilton hydroxylating system has been suggested for the analysis of aromatic compounds at 75 degrees. Calibration curves were linear in the range 0.0001-0.0001 M of aromatic compound, and molar absorptivities of 1000-5000 were observed. The results establish that (a) hydroxylation is a useful analytical process; (b) a model enzyme system can be exploited for its analytical utility; and (c) the concept of developing analytical selectivity by means of complex formation with cyclodextrins may be worth further exploitation. As one of the few methods available for the phenyl group as a functional group for analytical purposes, this technique has the advantages and limitations of a general functional group method. (Little-Battelle)
W73-12853

PARTICULATE MANGANESE IN SEA WATER STRESSING REGIMES IN MARINE ANOXIC BASINS,
Washington Univ., Seattle.
E. J. Fluorie.
Available from--Univ. Microfilms, Inc., Ann Arbor, Mich. 48106. Order No. 73-3708. Ph D Dissertation, 1972. 150 p.

Descriptors: *Sea water, *Manganese, *Dissolved oxygen, *Distribution patterns, *Hydrogen sulfide, Spectroscopy, Suspended solids, *Columbia River, Mathematical models.
Identifiers: *Emission spectroscopy, Saanich Inlet.

A method for the analysis of particulate Mn using emission spectroscopy was developed to determine the concentration of Mn in suspended matter. The distribution of particulate Mn in five anoxic basins was observed. The differences and similarities of these basins are shown by data obtained on their chemical and physical characteristics. In addition, the distributions of both particulate Mn and the physical and chemical variables were monitored in Saanich Inlet, a basin whose oxygen-hydrogen sulfide regime changes monthly. The particulate Mn distribution in the observed basins showed a consistent pattern which can be correlated to the oxygen and hydrogen sulfide regime. The results indicate Mn exists mainly in particulate form in the oxygenated water and in a soluble form in water containing hydrogen sulfide. A model based on chemical thermodynamics and inferred kinetics is proposed to explain the distribution of particulate Mn in marine anoxic basin. The concentrations of particulate Mn in the open ocean were found to be low unless influenced by land runoff and the values of the Columbia River reflected the particulate matter distribution described by previous investigations. (Little-Battelle)
W73-12854

A SIMPLE METHOD FOR RECORDING FISH HEART AND OPERCULUM BEATS WITHOUT THE USE OF IMPLANTED ELECTRODES,
Maine Univ., Orono. Dept. of Zoology.
For primary bibliographic entry see Field 07B.
W73-12858

IDENTIFICATION OF THE LIMITING NUTRIENT AND SPECIFIC GROWTH RATE,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 05C.
W73-12861

DETERMINATION OF LEAD IN PETROLEUM ADDITIVES USING ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Vanderbilt (R. T.) Co., Inc., East Norwalk, Conn.
G. R. Supp, I. Gibbs, and M. Juszli.
Atomic Absorption Newsletter, Vol 12, No 3, p 66-67, May-June 1973. 1 fig, 3 tab, 5 ref.

Descriptors: *Oil, *Lead, Heavy metals.
Identifiers: *Atomic absorption spectrophotometry, *Sample preparation, Lubricating oil, Grease, Crankcase oil, Lubricants, Lead diamyldithiocarbamate, Lead naphthenate, Lead dinonylnaphthalene sulfonate, Accuracy.

Petroleum samples were analyzed for lead compounds by dissolving samples and stardards directly in methyl isobutyl ketone and analyzing by atomic absorption. This procedure eliminated separations and acid breakdown followed by titration or precipitation reactions. Results of analysis by AA and wet chemistry agreed within experimental error when samples containing lead cyclohexanebutyrate, lead diamyldithiocarbamate, lead naphthenate, or lead dinonylnaphthalene sulfonate were analyzed. (Little-Battelle)
W73-12864

AN IMPROVED AA MICROSAMPLING SYSTEM,
Perkin-Elmer Corp., Norwalk, Conn.
F. J. Fernandez.
Atomic Absorption Newsletter, Vol 12, No 3, p 68-70, May-June 1973. 2 fig, 1 tab, 4 ref.

Descriptors: *Laboratory equipment, *Lead, Heavy metals, Mechanical equipment.
Identifiers: *Atomic absorption spectrophotometers, *Reproducibility, *Microsampling system, Blood, Atomic absorption spectrophotometry, Precision.

The Perkin-Elmer AA Microsampling System has been redesigned to improve performance, mechanical stability, and ease of operation. The changes include a new mounting system which attaches directly to the burner mount base, a slide mechanism having a smoother and shorter action, a heat shield usable with both the Delves Cup and Sampling Boat systems, plus a new mounting system for the Sampling Boat which permits rapid boat installation and interchange. Blood samples analyzed for lead show that the reproducibility of results is very good using the new system. (Little-Battelle)
W73-12865

AN IMPROVED METHOD FOR DETERMINING ORGANICS BY ACTIVATED CARBON ADSORPTION AND SOLVENT EXTRACTION - PT. II (TEST METHOD),
National Environmental Research Center, Cincinnati, Ohio.
R. W. Buelow, J. K. Carswell, and J. M. Symons.
Journal of the American Water Works Association, Vol 65, No 3, p 195-199, March 1973. 2 fig, 2 tab, 8 ref.

Descriptors: *Solvent extractions, *Adsorption, *Pollutant identification, *Activated carbon, Water pollution, Organic wastes, Organic compounds, Laboratory tests, Water analysis, Water sampling, Storage, Waste water (Pollution), Organic matter, Waste identification, Distillation, Gravimetric analysis.
Identifiers: *Dissolved organic matter, CAM sampler, Carbon chloroform extract, Carbon alcohol extract, Organic solvents.

The complete test procedure is presented for determining organics in water in the dissolved

form by activated carbon adsorption and solvent extraction. Organic materials adsorbed on a sample of activated carbon are removed by sequential extraction with two organic solvents. The extracts are processed by volume reduction through distillation and drying. The quantities of organic materials are then determined gravimetrically. This method is primarily for monitoring the general organic content of water and is not designed as a collector of organics for further identification, although, with certain precautions, the resulting extracts can be reprocessed. This method does not require expensive instrumentation and divides the organics into 2 general classes - chloroform soluble and alchol soluble. A special sampler (miniature CAM sampler) must be used in order to obtain a representative sample for this method. (See also W73-07574) (Holoman-Battelle)
W73-12866

VIRUSES IN METROPOLITAN WATERS: CONCENTRATION BY POLYELECTROLYTES, FREEZE CONCENTRATION, AND ULTRAFILTRATION,
Chicago Board of Health, Ill.
For primary bibliographic entry see Field 05F.
W73-12867

THE MONITORING OF ORGANIC MATTER WITH POLYURETHANE FOAM,
Manitoba Univ., Winnipeg. Dept. of Chemistry.
H. D. Gesser, A. B. Sparling, A. Chow, and C. W. Turner.
Journal of the American Water Works Association, Vol 65, No 3, p 220-221, March 1973. 1 fig, 8 ref.

Descriptors: *Organic matter, *Monitoring, *Water analysis, Water pollution, *Pollutant identification, Organic compounds, Methodology, Organic wastes, Waste water (Pollution), Water treatment, Solvent extractions, Efficiencies, Chemical analysis.
Identifiers: Polyurethane foam, Trace levels, Electron capture gas chromatography, Sample preparation.

Standard carbon adsorption apparatuses with the carbon replaced by previously cleaned and extracted polyurethane foam plugs were installed at the municipal water treatment plant at Morris, Manitoba, to determine the feasibility of the test method and the efficiency of the water treatment process. Water from the Red River which enters the plant is treated by the carbon-alum-chlorine method. The foam plugs were extracted with Lexane, concentrated in a flash evaporator, made up to a standard volume, and analyzed by electron capture gas chromatography. The results obtained showed that the treatment process did not reduce the organic contaminant level to any significant extent. The use of polyurethane foam plugs is a promising alternate to the carbon adsorption method for the determination of trace organic contaminants in water. (Holoman-Battelle)
W73-12868

CHARACTERIZATION OF CHEMICAL SLUDGES,
Missouri Univ., Columbia. Dept. of Civil Engineering.
R. J. Calkins, and J. T. Novak.
Journal of the American Water Works Association, Vol 65, No 6, p 423-428, June 1973. 8 fig, 5 tab, 6 ref.

Descriptors: *Sewage sludge, *Waste identification, Sludge treatment, Pollutant identification, *Missouri River, Solid wastes, Filtration, Coagulation, Water pollution sources, Treatment facilities, Missouri.
Identifiers: Characterization, *Chemical sludges, Settleable solids, Specific resistance, Cake solids, Filtration rates, Settleability, Cationic flocculants, Softening sludges.

The characteristics of sludges generated from the Missouri River were determined. The sludges collected from several treatment plants were characterized by their settled-solids concentration, filtering rate which includes the parameter 'specific resistance', and cake solids. The solids concentrations in the settled sludges were found to vary to some extent with the type of coagulant used, the turbidity of the water, and, in the case of mixed sludges (softening-coagulant), the variations in the lime dose. In evaluating sludge characteristics generated from a combined softening and coagulation process, it was found that the concentration of magnesium may greatly influence the results obtained. Comparisons of sluge solids from processes where no lime was added indicate that sludges generated from turbid waters can be expected to attain much higher settled-solids concentration than sludges from relatively clean waters. A relationship between cake solids and settled solids was found to exist for all sludges in this study. No simple relationship was found to exist for specific resistances of the various sludges. Several trends can be seen from the data, however. In general, combined softening-coagulant sludges filter much more readily than do pure coagulants. The presence or absence of magnesium seemed to have no influence on filtering characteristics of mixed sludges. Changes in the sludge characterization parameters occurred with time, primarily for the iron and alum residues. None of the changes was dramatic, but all indicate that sludge initally discharged from a treatment plant is somewhat different from sludge that is stored or lagooned. (Holoman-Battelle)
W73-12871

VOLTAMMETRIC STUDY OF THE HYDROGEN ION/HYDROGEN COUPLE IN ACETONITRILE/WATER MIXTURES,
Tennessee Univ., Knoxville. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W73-12872

SODIUM TUNGSTEN BRONZE AS A POTENTIOMETRIC INDICATING ELECTRODE FOR DISSOLVED OXYGEN IN AQUEOUS SOLUTION,
Ames Lab., Iowa.
P. B. Hahn, M. A. Wechter, D. C. Johnson, and A. F. Voigt.
Analytical Chemistry, Vol 45, No 7, p 1016-2021, June 1973. 10 fig, 4 tab, 10 ref.

Descriptors: *Dissolved oxygen, *Aqueous solutions, *Pollutant identification, *Indicators, *Chemical analysis, Chemical reactions, Inorganic compounds, Hydrogen ion concentration, Temperature, Iron, Copper, Mercury, Cations.
Identifiers: Sodium tungsten bronze electrodes, *Potentiometry, Precision, Accuracy, Ionic interference, EDTA, Chemical interference, Reproducibility.

Sodium tungsten bronzes, nonstoichiometric compounds, NaxWO3, with 0.5 less than x less than 0.9 were found to respond potentiometrically to dissolved oxygen in basic solutions. A Nernstian response, with a slope of approximately 120 mV per decade, was exhibited in the concentration range 0.2-8 ppm. Oxygen analyses were made in this range with precision and accuracy approaching plus or minus 5 percent. The large slope and other observations place serious doubt on customary oxygen redox reactions as possible mechanisms. An absorption mechanism is proposed which involves the displacement of adsorbed hydroxide ions by molecular oxygen. (Holoman-Battelle)
W73-12873

INSTRUMENTAL AND NUMERICAL CONSIDERATIONS FOR ON-LINE INTERPRETATION OF HIGH RESOLUTION MASS SPECTRAL DATA,
Wisconsin Univ., Madison. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W73-12874

POLYAROMATIC HYDROCARBONS IN HIGH-BOILING PETROLEUM DISTILLATES. ISOLATION BY GEL PERMEATION CHROMATOGRAPHY AND IDENTIFICATION BY FLUORESCENCE SPECTROMETRY,
Bureau of Mines, Laramie, Wyo. Laramie Energy Research Center.
J. F. McKay, and D. R. Latham.
Analytical Chemistry, Vol 45, No 7, p 1050-1055, June 1973. 11 fig, 2 tab, 17 ref.

Descriptors: *Separation techniques, Oil, Ion exchange, Pollutant identification.
Identifiers: *Polyaromatic hydrocarbons, *Gel permeation chromatography, *Ion exchange chromatography, *Thin layer chromatography, *Fluorescence spectroscopy, 1.12 2.3-dibenzoperylene, 1 12-o-phenyleneperylene, pyreno- (1.3:10'.2')pyrene, 2.3 10.11-dibenzoperylene, 1 2 4 5-dibenzopyrene, benzo (e)pyrene, benzo (g)chrysene, Crude oil, Petroleum distillates.

The identification of seven polyaromatic ring systems in petroleum is reported. The ring systems are 1.12,2.3-dibenzoperylene; 1,12-o-phenyleneperylene, pyreno- (1.3:10'.2')pyrene; 2.3,10.11-dibenzoperylene; 1,2,4,5-dibenzopyrene, benzo (e)pyrene, and benzo (g)chrysene. These polyaromatic hydrocarbons were isolated by a separation scheme involving ion exchange chromatography, gel permeation chromatography, and thin-layer chromatography and were identified by fluorescence spectroscopy. Gel permeation chromatography separated pericondensed aromatic ring systems from catacondensed ring systems and the other components of an acid concentrate. (Little-Battelle)
W73-12875

OPTIMUM PROCEDURE FOR THE DETERMINATION OF SELENIUM IN BIOLOGICAL SPECIMENS USING SE-77M NEUTRON ACTIVATION,
Veterans Administration Hospital, Omaha, Nebr.
A. J. Blotcky, L. J. Arsenault, and E. P. Rack.
Analytical Chemistry, Vol 45, No 7, p 1056-1060, June 1973. 5 fig, 2 tab, 14 ref.

Descriptors: *Neutron activation analysis, *Data processing, Radioactivity techniques, Irradiation, Pollutant identification.
Identifiers: *Tissue, *Blood, *Selenium, Biological samples, Sample preparation, Se-77m, Detectors, Detection limits.

An optimum procedure is outlined for the rapid quantitative determination of trace (greater than or equal to 0.06 microgram) selenium in serum and tissue using Se-77m neutron activation. Sample preparation, irradiation procedures, types of detector assemblies, and spectral analyses and data reduction are discussed. The optimum procedure tuilizing a low-power nuclear reactor consisted of irradiating lyophilized tissue samples or dialyzed-lyophilized serum samples for 20 sec, with a 20-sec decay time prior to radioassay. The most suitable radioassay assembly was the 5-mm X 3-in NaI (Tl) detector system. Spectral analyses and data reduction consisted of eliminating the interferences of isotopes of relatively long half-lives by spectrum subtraction and correction. Comparisons between the results obtained by the discussed Se-77m procedure and values quoted for an NBS Bovine Liver Standard were excellent. (Little-Battelle)
W73-12876

APPLICATION OF LIQUID CHROMATOGRAPHY TO POLLUTION ABATEMENT STUDIES OF MUNITION WASTES,
Army Natick Labs., Mass. Pioneering Research Lab.
J. T. Walsh, R. C. Chalk, and C. Merritt, Jr.

Analytical Chemistry, Vol 45, No 7, p 1215-1220, June 1973. 9 fig, 1 tab, 8 ref.

Descriptors: *Waste water (Pollution), *Water analysis, *Adsorption, *Resins, Industrial wastes, Pollution abatement, Separation techniques, Color, Activated carbon, Fish, Toxicity.
Identifiers: *TNT, *Liquid chromatography, Munitions plants, Amberlite XAD-2, Chromatograms, Styrene-divinylbenzene copolymer.

Since waste waters from TNT manufacture contain nitrobodies which are toxic (2.5 ppm toxic to fish), explosive, and colored, they consititute a serious pollution hazard. The application of liquid chromatography to pollution abatement studies of TNT waste waters is described. These studies include the characterization by liquid chromatography of the color formation occurring in TNT water, the development of a simple, direct analysis for alpha-TNT and a description of how liquid chromatography was used to evaluate pollution abatement processes for the removal of nitrobodies from munition waste waters. The abatement processes investigated were the column adsorption type, which required absorption isotherm, breakthrough capacity, saturation capacity, and column regeneration efficiency data. The acquisition of these data by liquid chromatographic means is described. The results showed that an adsorbent resin of the styrene-divinylbenzene copolymer type possessed nitrobody adsorption efficiencies at least equal to those of activiated carbon and had the important added advantages of easy chemical regeneration and significantly long life cycle. (Little-Battelle)
W73-12877

THE ASSOCIATION OF AMPHIPODS IN THE SHALLOW-WATER SAND HABITAT OF STRANGFORD LOUGH, CO. DOWN,
Queen's Univ., Belfast (Northern Ireland). Dept. of Zoology.
A. A. Fincham.
Journal of the Marine Biological Association of the United Kingdom, Vol 53, No 1, p 119-125, February 1973. 3 fig, 2 tab, 12 ref.

Descriptors: *Amphipoda, *Shallow water, *Systematics, *Speciation, Crustaceans, Benthic fauna, Dominant organisms, Sands, Marine animals, Invertebrates, Coarse sediments, Fluvial sediments, Saline soils, Soil analysis, Animal groupings, Classification, Varieties.
Identifiers: *Marine habitats, Strangford Lough, Beach fleas, Macroinvertebrates, Arthropods, Marinogammarus, Hippomedon denticulatus, Ampelisca brevicornis, Bathyporeia guilliamsoniana, Urothoe marina, Harpinia antennaria, Stenothoe monoculoides, Perioculodes longimanus, Pontocrates arenarius, Gammarus locusta, Dexamine spinosa, Aora typica, Microdeutopus chelifer, Lembos longipes, Microprotopus maculatus, Eurystheus maculatus, Jassa falcata, Ericthonius brasiliensis, Corophium crassicorne, Phtisica marina, Bathyporeia nana, Urothoe elegans.

Ten stations were sampled in the shallow-water sand habitat of Strangford Lough using a naturalist's dredge. Sediment samples were analyzed to determine median diameter (ranging from 1.13 to 3.23 phi), Phi quartile deviation (ranging from 0.17 to 0.65 phi) and Phi quartile skewness (ranging from -0.11 to -0.04 phi). Twenty-two species of amphipod belonging to thirteen families were identified; ten species were new records for Strangford Lough and the Family Phoxocephalidae was recorded for the first time. The average number of species per station was nine and average abundance was 660 amphipods per station. The most frequently occurring species was the caprellid Phtisica marina (present in 90 percent of the samples); the overall dominant species was the corophiid Corophium crassicorne representing 52 percent of all specimens recorded. A matrix of indices of similarity between stations based on species composition and of sediment type based on median diameter showed a close correlation; infaunal species showed a marked preference for sediment type. There were two main groupings: (1) at the entrance to the Lough, characterized by coarser sediments and rapid tidal streams and (2) stations further in the Lough with finer sediments and more gentle water movement. The evolution of this amphipod fauna is discussed and compared with the adjacent western Irish Sea shallow-water sand amphipod fauna. Post-glacial isolation and fine sediment deposition have acted as selection pressures in maintaining the association of amphipods found. (Holoman-Battelle)
W73-12879

BIOMASS CHARACTERISTICS OF THE ASIDIAN MOLGULA MANHATTENSIS (DEKAY),
Maryland Univ., Solomons. Natural Resources Inst.
D. H. Hamilton, Jr., and J. Yurchyk.
Chesapeake Science, Vol 14, No 1, p 67-68, March 1973. 2 tab, 6 ref.

Descriptors: *Biomass, *Biological properties, Invertebrates, Regression analysis, Volume, Marine animals, Secondary productivity, Chemical analysis.
Identifiers: *Macroinvertebrates, *Molgula manhattensis, *Tunicates, Characterization, Linear regression analysis, Dry weight, Wet weight, Ash-free dry weight.

Data are reported on wet weight, dry weight, ash-free dry weight, and volume for a random sample of 101 Molgula for the purpose of simplifying future calculations of its productivity. The relationships were examined between the various weight measures and between volume and weight by linear regression analysis. The average measurements were as follows (range in parentheses): Volume, 5.26 cc (0.67-11.56 cc); dry weight, 0.125 g (0.02-0.26 g); wet weight, 3.98 g (0.43-9.09 g); ash-free dry weight, 0.05 g (0.01-0.09 g). The correlation of volume with either weight measure is not strong and this is probably a consequence of assuming a spherical shape. Each of the weight measures is strongly correlated with the others (r greater than 0.90); in the future measurement of wet weight alone will permit rapid determination of biomass in the preferred units of ash-free dry weight. (Holoman-Battelle)
W73-12880

TOTAL MERCURY ANALYSIS: REVIEW AND CRITIQUE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
R. S. Reimers, W. D. Burrows, and P. A. Krenkel.
Journal Water Pollution Control Federation, Vol 45, No 5, p 814-828, May 1973. 2 tab, 156 ref.

Descriptors: *Analytical techniques, *Reviews, *Mercury, *Documentation, *Methodology, *Evaluation, Heavy metals, Aqueous solutions, Inorganic compounds, Neutron activation analysis, Polarographic analysis, Volumetric analysis, Colorimetry, Oxidation, Gravimetric analysis, Sediments, Soil analysis, Water analysis, Ion exchange, Chemical precipitation, Reduction (Chemical), Mass spectometry, Cations, Neutralization, Chemical reactions, Photometry, X-ray fluorescence.
Identifiers: Organomercury compounds, Biological samples, Environmental samples, Sample preparation, Chemical interference, Natural waters, Atomic absorption spectrophotometry, Ion selective electrodes, Dithizone method, Wet oxidation method, Amperometry, Flameless atomic absorption spectrophotometry, Preconcentration, Animal tissues, Blood, Errors, Electrodeposition, Mercuric sulfide, Mercurous chloride, Mercurous iodate, Mercurous oxalate, Mercurous cupferron, Mercurous chromate, Mercurous vanadate, Mercurous molybdate, Mercurous tungstate, Catalysis, Catalytic methods, Complexiметric titration, Oxidimetric titration, Iodide selective electrode, Detection limits, Sensitivity, Dimethyl mercury, Spark source mass spectrometry, Emission spectroscopy, Pyrolysis.

With the recent concern about mercury as an environmental hazard came numerous reviews and a large amount of research concerning new methods of mercury analysis. The history and an extensive literature review of mercury analysis are presented, as well as a critique of the different methods. Conclusions are presented as to the best method in terms of convenience, cost, simplicity, and sensitivity. At present, wet oxidation with potassium permanganate and potassium persulfate followed by chemical reduction and analysis of the elemental mercury by flameless atomic absorption spectroscopy is the most convenient method for determining total mercury. Economically, the best method remains the classical colorimetric dithizone technique. Atomic absorption instrumentation, because of its economy, simplicity, and sensitivity, is the most useful method for mercury analysis. (Holoman-Battelle)
W73-12885

SPECTROPHOTOMETRIC DETERMINATION OF AMMONIA,
Cham/Hill, Corvallis, Oreg.
C. Zadorojny, S. Saxton, and R. Finger.
Journal Water Pollution Control Federation, Vol 45, No 5, p 905-912, May 1973. 6 fig, 2 tab, 15 ref.

Descriptors: *Ammonia, *Water analysis, Sea water, Estuaries, Colorimetry, *Spectrophotometry, Salinity, *Waste water (Pollution), Ureas, Amino acids, Electrolytes, Absorption, Nitrites, Nitrates, Sulfides, Iodides, Carbonates, Bicarbonates, Fluorides, Copper, Manganese, Cadmium, Zinc, Mercury, Lead, Cobalt, Nickel, Aluminum, Iron, Ions, Freshwater.
Identifiers: Chemical interference, Detection limits, *Indophenol blue method, Sample preparation, Reproducibility, Chemical recovery, Cyanides, Thiocyanates, Thiosulfates, Barium, Tin, L-alanine, L-arginine, L-aspartic acid, L-histidine-HC, Glycine, L-hydroxyproline, L-isoleucine, L-lysine-HCl, L-methionine, L-phenylalanine, L-proline, L-serine, L-threonine, L-tryptophan, L-tyrosine, L-valine, Sulfites.

An improved indophenol blue method was investigated for the determination of ammonia in fresh, estuarine and marine waters, and wastewaters. Absorbance curves were prepared by adding known amounts of ammonium-nitrogen to ammonia-free water and to Pudget Sound seawater. Wastewaters were diluted, spiked, and analyzed to determine reproducibility of the method. Analyses were conducted to study the effects of 20 inorganic electrolytes, urea, or amino acids. No major interferences occured with these substances or as a result of variations in salinity. The range of ammonia determination was as follows: with intensifier, 0.001 to 1.0 mg/l ammonia nitrogen; without intensifier, 1 to 51 mg/l ammonia nitrogen. It is concluded that the method is simple and well suited for routine use. (Little-Battelle)
W73-12886

ATP POOLS IN PURE AND MIXED CULTURES,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
I. C. Kao, S. Y. Chiu, L. T. Fan, and L. E. Erickson.
Journal Water Pollution Control Federation, Vol 45, No 5, p 926-931, May 2973. 6 fig, 1 tab, 7 ref.

Descriptors: *E. coli, *Methodology, *Monitoring, Activated sludge, Sludge treatment, Efficiencies, Bioindicators, Cultures, Centrifugation, Cytological studies, Aerobic bacteria, Sewage bacteria.
Identifiers: *Adenosine triphosphate, *Pseudomonas aeruginosa, Firefly luminescence, Cul-

ture media, Luciferin-luciferase method, Mixed cultures, Pure cultures, Species interaction, Bacterial physiology, Glucose, Sample preparation.

E. coli and Pseudomonas aeruginosa were grown in a mixed culture for about 9 hr at 30C with glucose as an energy source. The same organisms were also grown separately in the same medium. After recovery, washing and drying, the glucose concentration was determined by the glucostat method and ATP concentration by use of a biometer. The sample was prepared for ATP measurement by mixing one ml of culture broth with one ml butanol for 10 sec to lyse the cells. Eight ml of octanol was added, the sample was vigorously shaken for 10 sec and centrifuged at 3000 rpm for 3 min. Butanol was partitioned into the top octanol layer and ATP into the bottom aqueous layer. The extracted ATP (0.01 ml) was then injected into a biometer tube containing luciferin and luciferase. The resultant light flash was converted into an electrical signal and then a decimal count representing the concentration of ATP in the sample. The fact that the ATP concentration in the cells from the mixed culture was appreciably smaller than that in the pure cultures indicated that the species in the mixed culture interact. The fact that cell yields in mixed cultures were far smaller than those in pure cultures also indicated the existence of such interaction. (Mortland-Battelle)
W73-12887

THE USE OF FISH AS SENSORS IN INDUSTRIAL WASTE LINES TO PREVENT FISH KILLS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-12889

INSECTICIDE RESIDUES IN WATER AND SEDIMENT FROM CISTERNS ON THE U.S. AND BRITISH VIRGIN ISLANDS - 1970,
Central Michigan Univ., Mount Pleasant. Dept. of Biology.
For primary bibliographic entry see Field 05B.
W73-12894

AN IMMOBILIZED CHOLINESTERASE PRODUCT FOR USE IN THE RAPID DETECTION OF ENZYME INHIBITORS IN AIR OR WATER,
Midwest Research Inst., Kansas City, Mo.
L. H. Goodson, W. B. Jacobs, and A. W. Davis.
Analytical Biochemistry, Vol 51, No 2, p 362-367, February 1973. 1 fig, 1 tab, 5 ref.

Descriptors: *Monitoring, *Water pollution, *Insecticides, Pollutant identification, Air pollution, Organophosphorus pesticides, Carbamate pesticides, Adsorption, Stability, Methodology.
Identifiers: *Enzymatic inhibitors, *Cholinesterase, *Enzyme activity, Enzyme preparation.

Cholinesterase has been immobilized on the surface of open-pore urethane foam in a two-step process in which (1) cholinesterase is adsorbed on aluminum hydroxide gel during the precipitation of the aluminum hydroxide from a solution of aluminum chlorohydroxide, and (2) the aluminum hydroxide gel-enzyme precipitate is suspended in a starch slurry and applied to urethane foam. The resulting product is shown to retain its activity during monitoring of water for the presence of certain organophosphate and carbamate insecticides. Details are given for the preparation of both the plain starch gel-immobilized product and for the improved aluminum hydroxide gel-starch gel enzyme pads. (Holoman-Battelle)
W73-12901

SOME MARINE DIATOMS FROM THE GALAPAGOS ISLANDS,
For primary bibliographic entry see Field 02I.
W73-12902

THE CHARACTERIZATION OF SOLUBLE PHOSPHORUS RELEASED BY LIMNETIC ZOOPLANKTON,
Toronto Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 05B.
W73-12904

AN EVALUATION OF LIQUID SCINTILLATION COUNTING TECHNIQUES FOR USE IN AQUATIC PRIMARY PRODUCTION STUDIES,
Queen Elizabeth Coll., London (England). Dept. of Biology.
P. R. Pugh.
Limnology and Oceanography, Vol 18, No 2, p 310-319, March 1973. 2 fig, 1 tab, 25 ref.

Descriptors: *Evaluation, *Primary productivity, Methodology, *Radioactivity techniques, *Aquatic environment, Aquatic productivity, Carbon radioisotopes, Diatoms, Chrysophyta, Marine algae, Yeasts, Marine fungi, Phytoplankton, Surfactants.
Identifiers: *Liquid scintillation, *Scintillation counting, Membrane filters, Accuracy, Reagents, Solubilization, Phaeodactylum tricornutum, Metschnikovia zobelli, Soluene-100, Hyamine 10-X, Triton X-100, NCS, C-14.

Methods evaluated for the liquid scintillation counting of samples from aquatic primary production studies include the counting of intact filters and cells in a toluene fluor, solubilization and counting of membrane filters and cells in various reagents, and counting of a suspension of cells mixed with the fluor. A 1:1 Triton X-100:toluene fluor was very effective for the suspension of cells and gave high counting efficiencies. Up to 5 ml of sample could be mixed with the fluor, but this was considered inadequate for most primary production studies. The filter standardization method for the counting of intact filters was investigated further and found to be applicable over a wide range of conditions but only accurate when the weight of algae on the filters was small (less than 1 mg). Direct solubilization of the filters and cells in a naphthalene-dioxane or 2-methoxyethanol-toluene fluor were the simplest, most accurate, and economical methods for primary production studies; the latter dissolved both wet and dry cellulose nitrate membrane filters and gave excellent replicate counting. (Holoman-Battelle)
W73-12907

MEMBRANE FILTER RETENTION--A SOURCE OF ERROR IN THE C-14 METHOD OF MEASURING PRIMARY PRODUCTION,
Atomic Energy of Canada Ltd., Chalk River (Ontario. Environmental Research Branch.
J. W. McMahon.
Limnology and Oceanography, Vol 18, No 2, p 319-324, March 1973. 5 fig, 1 tab, 10 ref.

Descriptors: *Primary productivity, Methodology, *Water analysis, *Radioactivity techniques, *Retention, *Measurement, Phytoplankton, Volume, Carbon radioisotopes, Absorption, Chemical analysis.
Identifiers: *Membrane filters, *Error sources, Liquid scintillation, Scintillation counting, C-14, Asterionella formosa, Maskinonge Lake, Grenadier Pond.

The relationship between volume of water filtered and apparent specific activity of phytoplankton in which the latter decreases (cpm C-14/ml) with increasing volume filtered, previously attributed to cellular damage to phytoplankton during vacuum filtration, is now considered mainly due to retention of unfixed radiotracer on the membrane filter. The retention capacity for C-14 by the filter, expressed as radioactivity per milliliter filtered, is maximum for small sample volumes (less than or equal to 1 ml), decreasing to a constant value when sample volumes are larger than 100 ml. This is attributed partially to adsorption in the filter and probable retention of C-14 bound to unknown substances in the water or on the filter which are eluted or exchanged by passage of volumes of water of 100 ml or greater. This 'washing' effect permits almost all of the C-14 not fixed in organisms to pass through the filter. (Holoman-Battelle)
W73-12908

SUGAR-COATED DAPHNIA: A PRESERVATION TECHNIQUE FOR CLADOCERA,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
D. J. Hall.
Limnology and Oceanography, Vol 18, No 2, p 331-333, March 1973. 1 fig, 4 ref.

Descriptors: *Daphnia, *Methodology, Zooplankton, Invertebrates, *Crustaceans.
Identifiers: *Sample preservation, *Sucrose, Macroinvertebrates, Daphnia pulex, Daphnia galeata.

A simple preservation technique is described which utilizes sucrose to prevent carapace distortion and loss of broodpouch contents due to ballooning in Daphnia. Zooplankton samples collected from Little Mill Lake by vertical tows of a 75-micron-mesh plankton net through 9 m were transferred to a 75-micron Nitex screen glued to the bottom of an acrylic cylinder, immersed in carbonated water, washed into sample bottles containing appropriate concentrations of sucrose and 4 percent formalin. Carapace distortion and loss of eggs by preserved specimens were prevented by adding 40 g/liter sucrose to 4 percent formalin. Differences in size and species composition may influence the threshold sugar concentration at which ballooning is prevented. (Holoman-Battelle)
W73-12910

QUANTITATIVE SAMPLING OF LIVE ZOOPLANKTON WITH A FILTER-PUMP SYSTEM,
Pacific Gas and Electric Emeryvill, Calif. Engineering Research Dept.
J. W. Icanberry, and R. W. Richardson.
Limnology and Oceanography, Vol 18, No 2, p 333-335, March 1973. 1 fig, 7 ref.

Descriptors: *Zooplankton, *Equipment, *Efficiencies, Plankton nets, Methodology, Construction, Water sampling, Filtration, Mortality, Thermal pollution, Cooling water.
Identifiers: *Filter-pump system *Quantitative sampling, Performance evaluation, Survival.

A conventional plankton net was inadequate for study of the survival of zooplankton passing through the cooling water systems of thermal power plants. A filter collection system was designed which allows survivals of 90-95 percent by reducing water velocities and turbulence within the collection chamber. The filter-pump system consisted of a specially designed filter connected to a Labawco type P general purpose centrifugal pump driven by an electric motor. Comparisons of fishing abilities did not show any significant differences between a filter pump and a plankton net. (Holoman-Battelle)
W73-12911

BACTERIAL CONTENT OF PARTICULATE MATTER IN OFFSHORE SURFACE WATERS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W73-12912

BEHAVIOR OF THE GOLDFISH AS AN EARLY WARNING SYSTEM FOR THE PRESENCE OF POLLUTANTS IN WATER,
Polytechnic Inst. of Brooklyn, N.Y. Dept. of Social Sciences.
K. Salzinger, S. P. Fairhurst, S. J. Freimark, and F. D. Wolkoff.
Journal of Environmental Systems, Vol 3, No 1, p 27-40, Spring 1973. 2 fig, 31 ref.

Descriptors: *Pollutant identification, *Bioindicators, *Fish behavior, *Water pollution, Mercury, Lethal limit, Water pollution effects, Toxicity, Reviews, Hydrogen ion concentration, Salinity, Water temperature, Pesticides, Heavy metals, Alkali metals, Aluminum, Cadmium, Cobalt, Calcium, Copper, Iron, Lead, Manganese, Potassium, Strontium, Zinc, Magnesium.
Identifiers: *Goldfish, *Carassius auratus, *Biomonitoring, Barium, Lithium, Silver, Tin.

The literature on the effects of pollutants on fish, particularly goldfish, in terms of lethal dosage and behavioral changes are reviewed. Results are presented of an experiment showing the effects of two very low concentrations of mercury on the behavior of goldfish. Twelve goldfish were conditioned to form different behavior patterns to obtain food (three fish to each pattern). After stabilization of these patterns, one fish from each pattern was placed in mercury polluted water at a concentration of 0.01 ppm, one in water polluted at 0.006 ppm, and the third in unpolluted water. All four fish placed in the more highly polluted water showed the largest drop in response rate. All but one of the fish placed in the lower-concentration polluted water showed greater decrease in response than those in the unpolluted water. The results suggest that the goldfish might be a potential pollution monitor. (Mortland-Battelle)
W73-12916

POLIOVIRUS IN A WATER SUPPLY,
Michigan Dpt. of Public Health, Lansing. Bureau of Environmental Health.
For primary bibliographic entry see Field 05B.
W73-12922

DDT IN SOME NEW ZEALAND MARINE AND FRESHWATER FAUNA,
Department of Agriculture, Wellington (New Zealand). Wallaceville Animal Research Center.
S. R. B. Solly, and D. L. Harrison.
New Zealand Journal of Marine and Freshwater Research, Vol 6, No 4, p 456-62, December 1972. 1 fig, 2 tab, 10 ref.

Descriptors: *DDT, *DDD, *DDE, *Polychlorinated biphenyls, *Gas chromatography, Freshwater fish, Marine fish, Crayfish, Mussels, Oysters, Absorption, *Marine animals, Eels, Rainbow trout.
Identifiers: Sample preparation, Biological samples, *Lindane, Detection limits, *New Zealand, Recovery, Anguilla australis schmidtii, Anguilla diefenbachii, Polyprion oxygeneois, Rhombosolea plebeia, Salmo gairdneri, Parapercis colias, Sardinops neopilchardus, Jasus edwardsii, Perna canaliculus, Ostrea lutaria, Macroinvertebrates, Blue cod, Flounder, Pilchard, Groper.

Ten species of fish, crustaceans, and mollusks, taken from inland and coastal waters of New Zealand in 1969-70, mostly before the legislative ban on DDT, were analyzed for residues of lindane, polychlorinated biphenyls (PCB), and DDT and its metabolites. Samples were macerated, extracted, and analyzed by gas chromatography. The detection limit was 0.01 ppm and recoveries were 82 percent for DDE, 78 percent for DDD, 78 percent for DDT, 78 percent for lindane, and 95 percent for PCB. DDE was the only organochlorine compound detected in six species, and DDE was the major residue in all others. DDD and/or DDT was present only in eels (Anguilla australis schmidtii, A. diefenbachii), groper (Polyprion oxygeneois), and some flounder (Rhombosolea plebeia). No lindane or PCB was found in any of the samples. The range of total DDT levels in edible flesh was 0-0.20 parts per million (on a fresh tissue basis) and the mean residue level for all specimens was 0.02 ppm. The incidence of residues appeared to be related to the regional use of DDT. (Little-Battelle)
W73-12925

OPTICAL PROPERTIES AND COLOR OF LAKE TAHOE AND CRATER LAKE,
Scripps Institution of Oceanography, La Jolla, Calif.
R. C. Smith, J. E. Tyler, and C. R. Goldman.
Limnology and Oceanography, Vol 18, No 2, p 189-199, March 1973. 11 fig, 1 tab, 26 ref.

Descriptors: *Optical properties, *Color, Depth, *Light penetration, *Solar radiation, Physical properties, Secchi disks, *Oregon, *California, Upwelling, Water quality, Aquatic habitats, Aquatic environment, Water properties.
Identifiers: *Lake Tahoe, *Crater Lake, Spectroradiometer, Spectral irradiance, Seasonal variation.

Spectral irradiance has been measured as a function of depth in Crater Lake, Oregon and Lake Tahoe, California. In Lake Tahoe, Secchi disk observations and submarine photometer measurements have been recorded year round since July 1967 and beam transmittance has been measured as a function of depth. From these data the radiant energy input and certain optical properties of the two lakes are presented. Since color is a principal esthetic feature of these lakes, a complete color analysis is also presented. This information provides an objective standard with which to compare possible future changes in the optical properties and in the esthetic appearance of Crater Lake and Lake Tahoe. The method can be applied generally to quantify the optical deterioration of any aquatic habitat and can detect such deterioration before it is noticeable by casual visual observation. (Holoman-Battelle)
W73-12926

THORIUM IN WATER AND ALGAE FROM THE ADRIATIC SEA,
Institut Rudjer-Boskovic, Rovinj (Yugoslavia). Center for Marine Research.
P. Strohal, and T. Pinter.
Limonology and Oceanography, Vol 18, No 2, p 250-253, March 1973. 2 tab, 20 ref.

Descriptors: *Sea water, *Chemical analysis, *Marine algae, *Neutron activation analysis, Heavy metals, Chlorophyta, Phaeophyta, Rhodophyta, Radiochemical analysis, Water analysis, Salinity, Methodology, Kelps, Radioactivity, Separation techniques, Radioactivity techniques.
Identifiers: *Thorium, *Adriatic Sea, Rare earth elements, Preconcentration, Pa-233, Sample preparation, Protactinium radioisotopes, Valonia utricularis, Cladophora pellucida, Codium dichotomum, Enteromorpha linza, Cystoseira barbata, Cytoseira abrotanifolia, Scytosiphon lomentaria, Padina pavonia, Halopteris scoparia, Calpomenia sinuosa, Dictyota dichotoma, Fucus virsoides, Ceramium rubrum, Vidalia volubilis, Rhodimenia palmeta.

Samples of seawater and algae collected along the coast of the Rovinj region in the North Adriatic were analyzed for the presence of thorium by neutron activation analysis (NAA). Thorium was preconcentrated by coprecipitation with Fe (OH)3, which was precipitated by the addition of FeC13 solution and NaOH to either filtered or unfiltered seawater. The samples were stirred well and Th separated from solution using Buchner vacuum filters or a centrifuge. The precipitate was dissolved in HC1, Fe removed by organic extraction, water phase evaporated, dried, irradiated and analyzed by NAA. Pa-233 radioactivities were measured in all samples and compared to standards. Samples of algae were measured, carefully separated, identified, and washed with seawater to remove impurities. The samples were slowly dried at 110 C, ignited at 450 C, reduced to constant weight, and analyzed by NAA as were the seawater samples. In filtered seawater, values were 0.8 pg Th/l and lower; for unfiltered seawater samples, values about three orders of magnitude higher were obtained. Thorium concentrations in marine algae are in the range of 1 to 0.01 microgram Th/g ashed material. (Holoman-Battelle)
W73-12927

CHEMISTRY AND TROPHIC STATUS OF SEVEN NEW ZEALAND LAKES,
Department of Scientific and Industrial Research, Taita (New Zealand). Soil Bureau.
For primary bibliographic entry see Field 05C.
W73-12928

THE PHYSIOGNOMY AND STRUCTURE OF THE BENTHIC MACROPHYTE COMMUNITIES ON ROCKY SHORES IN THE SOUTHWESTERN ARCHIPELAGO OF FINLAND (SEILI ISLANDS),
Turku Univ. (Finland) Dept. of Botany.
O. Ravanko.
Nova Hedwigia, Vol 23, Nos 2-3, p 363-404, 1972. 23 fig, 22 ref.

Descriptors: *Biomass, *Marine plants, *Biological communities, *Benthic flora, Marine algae, Cyanophyta, Chlorphyta, Phaeophyta, Rhodophyta, Marsh plants, Water sampling, Sago pondweed, Kelps, Ditch grass, Monocots.
Identifiers: *Finland, *Macrophytes, *Physiognomy, *Marine environment, Vegetation profiles, Spermatophytes, Charophyta, Chaetomorpha, Enteromorpha, Ulothrix, Lithoderma, Mytilus edulis, Horned pondweed, Water milfoil, Sea grasses, Widgeon grass.

The physiognomy and structure of the benthic macrophyte communities on rocky shores in the southwestern archipelago of Finland (Seili Islands) have been studied. Rows of 1 sq m quadrats were marked out along 23 lines, their vegetation was mapped and the macrophytes were then harvested. The species were determined and belts were named according to the dominant species. The fresh and dry weights and the ash content of the material were determined. The vegetation can mostly be divided into three main belts: the Cladophora, Fucus and Potamogeton belts. Besides differing in species composition these three belts also differ in biomass. For comparison, the water and ash contents of some individual species were determined. The ash contents differ greatly between the species. Some taxonomic problems and sources of error in the research methods are treated. The extent to which the vegetation of the study area is typical of the southwestern archipelago of Finland is discussed, and some of the results are compared with those from other areas. (Holoman-Battelle)
W73-12929

ANALYTICAL REVIEWS 1973/APPLICATIONS.

Analytical Chemistry, Vol 45, No 5, pIR-403R, April 1973. 13080 ref.

Descriptors: *Analytical techniques, *Chemical analysis, *Air pollution, *Water pollution, *Reviews, *Methodology, *Documentation, *Pollutant identification, *Instrumentation, *Pollutants, Organic compounds, Inorganic compounds, Physical properties, Laboratory tests, Reliability, Chemical properties, Rdioactivity techniques, On-site investigations, Radiochemical analysis, Water analysis.
Identifiers: Sample preparation, Collaborative studies.

The following are reviewed articles concerned with analytical methods that may be applicable to environmental studies: (1) Air Pollution by Peter K. Mueller and Evaldo L. Kothny, (2) Essential Oils and Related Products by Ernest Guenther, Gilbertson, and Roman T. Koenig, (3) Fertilizers by Charles W. Gehrke, Larry L. Wall, Sr., and Paul R. Rexroad, (4) Pesticide Residues by Wayne Thornburg, (5) Petroleum by Richard W. King, (6) Pharmaceuticals and Related Drugs by David W. Cornish, Daniel M. Grossman, Allen L. Jacobs, Arthur F. Michaelis, and Ben Salsitz, (7) Water Analysis by Marvin J. Fishman and David E. Erdmann, and (8) Food by James A. Yeransian, Katherine G. Sloman, and Arthur K. Foltz. (Holoman-Battelle)
W73-12930

DETERMINATION OF URANIUM IN URINE SPECIMENS FOLLOWING THEIR SEPARATION THROUGH ANION EXCHANGE, (BESTIMMUNG DES URANS IN URINPROBEN NACH DESSEN ABTRENNUNG DURCH ANIONENAUSTAUSCH),
Vienna Univ. (Austria). Analytisches Institut.
J. Korkisch, and I. Steffan.
Mikrochimica Acta, p 273-278, March 1973. 2 tab, 4 ref.

Descriptors: *Urine, *Separation techniques, *Ion exchange, Heavy metals, Water analysis, Resins, Adsorption, Fluorometry.
Identifiers: *Uranium, Sample preparation, Detection limits.

A separation method that is generally applicable for uranium in the analysis of urine specimens is described. This is based on the adsorption of the uranium on the strongly basic anion exchanger Dowex 1, X8 from human urine that has been strongly acidified with hydrochloric acid, whereby most of the organic components, phosphoric acid and most mineral urine components are removed. Thus it becomes possible to separate the uranium compounds rapidly and simply without prior evaporation of the urine and destruction of the organic compounds. If need be, the foreign ions that are adsorbed along with the uranium, such as iron and also adsorbed urine coloring materials, are removed through subsequent washing of the resin with a mixture of 50 vol percent tetrahydrofurane, 40 vol percent methylglycol and 10 vol percent 6 N hydrochloric acid, and the uranium is eluted with 1 N hydrochloric acid. The determination of the uranium in the eluate can then be conducted without interference by the fluorometric method. (Little-Battelle)
W73-12931

DETERMINATION OF ALKYLBENZENESULFONATE (ABS) IN BOTTOM SEDIMENT,
Tokyo Metropolitan Univ., Tokyo. Dept. of Chemistry.
Y. Ambe.
Environmental Science and Technology, Vol 7, No 6, p 542-545, June 1973. 5 fig, 2 tab, 7 ref.

Descriptors: *Alkylbenzene sulfonates, *Bottom sediments, Lakes, Oceans, *Colorimetry, *Methodology, *Pollutant identification, Chemical analysis, Rivers, Water pollution, Separation, Techniques, Aquatic soils, Soil analysis, Mud, Solvent extractions, Detergents.
Identifiers: *Infrared spectrophotometry, Methylene blue active substance, Sample preparation, Chemical recovery, Dodecylbenzene sulfonate, Infrared spectra, Detection limits, Vertical distribution, Reproducibility, Lake Motosu, Lake Kizaki, Lake Aoki, Lake Shoji, Sagami Bay, Lake Suwa, Japan, Tokyo Bay, Absorbance.

A new method for the analysis of alkylbenzenesulfonate (ABS) in bottom sediments of a polluted river, a lake, and the sea was examined and the availability of the method was verified. Methylene blue active substance (MBAS) was extracted from dried mud sample with methanol benzene (1:1) mixture. After the solvent was completely evaporated, the residue was dissolved into distilled water and the concentration of MBAS was determined from the ratio of peak heights at wavenumber 1010/cm and at 890/cm of the infrared spectrum of MB-MBAS complex. Multiplying the value of MBAS by ABS/MBAS, the net content of ABS in the sediment was determined. Applying this method to the study of polluted lake sediments and marine sediments, some geochemical information on the process and rate of recent sedimentation in the lake and sea was obtained. (Holoman-Battelle)
W73-12932

SENSITIVITY AND DETECTABILITY LIMITS FOR ELEMENTAL ANALYSIS BY PROTON-INDUCED X-RAY FLUORESCENCE WITH A 3 MV VAN DE GRAAFF,
Los Alamos Scientific Lab., N. Mex.
C. J. Umbarger, R. C. Bearse, D. A. Close, and J. J. Malanify.
Available from the National Technical Information Service as LA-DC-72-1069. Report No. Conf-720801-2, 1972. 13 p, 4 fig, 1 tab, 13 ref.

Descriptors: *Heavy metals, *X-ray fluorescence, Titanium, Iron, Nickel, Copper, Gold, Lead.
Identifiers: *Sensitivity, *Detection limits, Proton-induced x-ray fluorescence, Proton accelerators, Vanadium, Germanium, Rubidium, Zirconium, Tin, Antimony, Cerium, Samarium, Dysprosium, Thulium, Tungsten, Bismuth, Thorium, Uranium, Silver.

Protons from a 3 MV Van de Graaff have been used to produce characteristic x-rays from 21 elements spanning the periodic table. The elements analyzed Ti, V, Fe, Ni, Cu, Ge, Rb, Zr, Ag, Sn, Sb, Ce, Sm, Dy, Tm, W, Au, Pb, Bi, Th, and U. Absolute K alpha and L alpha x-ray production cross sections have been determined, allowing one to calculate sensitivities for any given sample, detector geometry, and proton beam parameters. Elemental detectability limits are discussed assuming various backings and matrix materials. The large number of available small proton accelerators throughout the United States promises wide applicability of this technique to environmental and biomedical analysis. (Little-Battelle)
W73-12935

TRACE ELEMENT TRAPPING IN PTEROPOD TESTS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 05B.
W73-12937

RADIOCHEMICAL MONITORING OF WATER AFTER THE CANNIKIN EVENT, AMCHITKA ISLAND, ALASKA, OCTOBER, 1972,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 05B.
W73-12945

A HYDROGRAPHIC ATLAS OF LARGER NORTH CAROLINA SOUNDS,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
For primary bibliographic entry see Field 02L.
W73-12948

HYDROLOGIC RECORDS FOR LAKE COUNTY, FLORIDA: 1971-72,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02E.
W73-12949

SOLUBLE SILICA AND FLUORIDE IN SOME SURFACE AND GROUND WATERS OF MYSORE STATE,
University of Agricultural Sciences, Bangalore (India). Dept. of Chemistry and Soils.
For primary bibliographic entry see Field 02K.
W73-12969

SIMULTANEOUS POLAROGRAPHIC DETERMINATION OF IRON (II) AND IRON (III) IN COAL MINE WASTE WATER,
Indiana Univ. of Pennsylvania. Dept. of Chemistry.
S. L. Tackett, and L. F. Wieserman.
Anal Lett. Vol 5, No 9, p 643-651. 1972. Illus.
Identifiers: Coal mine wastes, *Iron, *Mine waste water, *Polarographic determination, Waste waters.

Polarography with a sodium carbonate-oxalic acid supporting electrolyte was used to determine both Fe (II) and Fe (III) simultaneously in actual coal mine water samples. The average relative percent error was 2.2% for Fe (II) and 2.1% for Fe (III) over a range of 10-500 ppm. In actual mine water the Fe (II) content was highest where the mine water emerged. As the water moved down stream from the source of pollution Fe (II) decreased the Fe (III) concentration increased as Fe (II) was oxidized to Fe (III) by the O. This was accompanied by a decrease in pH. Further down the stream Fe (III) started to precipitate and then its concentration steadily decreased.--Copyright 1973, Biological Abstracts, Inc.
W73-12976

5B. Sources of Pollution

WATER QUALITY HYDROLOGY OF LANDS RECEIVING FARM ANIMAL WASTES,
Texas A and M Univ., College Station Water Resources Inst.
D. L. Reddell, G. G. Wise, R. E. Peters, and P. J. Lyerly.
Available from the National Technical Information Service as PB-222 181, $3.00 in paper copy, $1.45 in microfiche. Technical Report No 50, June 1973, 110 p, 23 fig, 26 tab, 61 ref. OWRR A-015-TEX (1), 14-31-0001-3844.

Descriptors: *Farm wastes, Waste disposal, Water pollution sources, Nitrates, Denitrification, *Feed lots, *Texas, *Water quality, *Soil disposal fields, Path of pollutants.
Identifiers: Bellvile (Tex), Pecos (Tex), and El Paso (Tex).

A significant pollution potential from cattle manure has developed as a result of the cattle feeding industry progressing to large, high density feeding operations. The objectives of this study were to determine the characteristics of storm runoff from a beef feedlot and to evaluate the disposal of large amounts of manure on land. Feedlot runoff was found to carry large amounts of chemical elements. The concentrations of chemical elements did not vary with size and intensity of rainstorm as much as by topographic differences of the watersheds. More ammonia was volatilized from high pH soil columns than neutral pH soil columns. A total nitrogen loss of 10 to 20 percent occurred in the soil columns. Up to 900 tons/acre of manure can be safely plowed under 30 to 36 inches deep without creating a surface water pollution problem. An increase of salts in the groundwater occurred during the first year and then salts were reduced to initial values the second year. No nitrate pollution of groundwater occurred. Crops can be effectively grown on land receiving up to 900 tons/acre of manure. Peak yields occur the second and third year after plowing under. (Runkles-Texas)
W73-12353

ASPECTS OF THE BIOGEOCHEMISTRY OF CARBOHYDRATES AND PROTEINS IN AQUATIC ENVIRONMENTS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05C.
W73-12371

PREDICTION OF MIXING LENGTHS FOR RIVER FLOW GAGING,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
P. R. B. Ward.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY7, Paper 9856, p 1069-1081, July 1973. 5 fig, 1 tab, 18 ref, append.

Descriptors: *Mixing, *Discharge measurement, *Tracers, Dispersion, Sampling, Radioactivity techniques, Radioisotopes, Stream gages, Path of pollutants.

An analytical solution of the diffusion equation determines criteria for use in river flow gaging by the dilution method. The method allows the mixing length to be predicted from the channel geometry. The mixing length is the distance required for tracer from a point injection to become mixed across the cross section. The mixing length depends mainly upon the ratio of the square of the breadth of channel to the mean depth. The mixing length calculated by this method is compared with the injection point to sampling point distances in successful flow gagings by various workers. (Knapp-USGS)
W73-12414

TRITIUM AND DEUTERIUM CONTENT OF THE SNOW IN GROENLAND,
L. Merlivat, J. Ravoire, J. P. Vergnaud, and C. Lorius.
Earth and Planetary Science Letters, Vol 19, No 2, p 235-240, June 1973. 7 fig, 2 tab, 13 ref.

Descriptors: *Snow, *Firn, *Tritium, *Deuterium, *Snowfall, Regimen, Water balance, Tracers, Sampling, Radioactive dating, Stable isotopes.
Identifiers: *Greenland.

Deuterium and tritium measurements were made on firn samples taken along a central axis across Greenland. Accumulation values determined from tritium profiles decrease regularly from 54.7 cm of water per year on the west coast to 18.1 cm of water per year on the east coast. A correlation is demonstrated between the tritium deposition rate and the altitude of the precipitation collection site. (Knapp-USGS)
W73-12418

EVALUATION OF ERTS DATA FOR CERTAIN OCEANOGRAPHIC USES,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 07B.
W73-12429

A TOPOLOGICALLY OPTIMUM RIVER SAMPLING PLAN FOR SOUTH CAROLINA,
South Carolina Univ., Columbia. Dept. of Geology.
W. E. Sharp.
Available from the National Technical Information Service as PB-222 278, $3.00 in paper copy, $1.45 in microfiche. Water Resources Research Institute, Clemson University, Clemson, S. C., Report No. 36, April 1973, 31 p, map, 5 fig, 4 tab, 9 ref. OWRR S-020-SC (1), A-026-SC (4).

Descriptors: *Water sampling, *Drainage patterns (Geologic), Monitoring, Water pollution sources, *South Carolina, Planning, Pollutant identification, Data collections.
Identifiers: *Edisto River (SC), Pee Dee River (SC), Santee River (SC), Savannah River (SC), *Topologically optimum plan, Sequential analysis.

A sequential river sampling plan has been developed which is independent of the shape of a drainage basin. Mathematical analysis indicates this sampling plan will be the optimum one in the search for a pollutant coming from a single source. The procedure consists of sequential sampling at successive centroids of the river basin such that only the contaminated portion is followed after each step. The site selection for all possible source locations need only be performed once using standard river basin maps. This selection has been performed for all river basins in South Carolina and the results are summarized on a composite drainage map of the State. The map shows that under ideal circumstances no more than 11 sequential samples would be needed to locate a unique pollution source on any of the rivers of South Carolina. Many practical problems require that a simultaneous sampling plan be used and for this purpose the necessary sampling sites can be selected quickly from among the sites already marked on the map as sequential sites. These sites are uniformly distributed and a 50% sequential coverage of the state is possible using a simultaneous plan of only 81 sites. These have been listed in order of priority and their locations are specified in terms of road numbers where highway bridges are closest to each site.
W73-12498

NUMERICAL THERMAL PLUME MODEL FOR VERTICAL OUTFALLS IN SHALLOW WATER,
Oregon State Univ., Corvallis. Dept. of Mechanical and Nuclear Engineering.
D. S. Trent, and J. R. Welty.
Copy available from GPO Sup Doc as EP1.23/2:73-162, $4.80; microfiche from NTIS as PB-221 488, $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-162, March 1973. 486 p, 115 fig, 12 tab, 113 ref.

Descriptors: Waste disposal, *Turbulent flow, Jets, Temperature, *Thermal pollution, *Heated water, Forecasting, Model studies, *Outlets, Water pollution sources, Path of pollutants.
Identifiers: *Waste heat disposal.

A theoretical study of the heat and momentum transfer resulting from a flow of power plant condenser effluent discharged vertically to shallow, quiescent coastal receiving water is presented. The complete partial differential equations governing steady, incompressible, turbulent flow driven by both initial momentum and buoyancy are solved using finite-difference techniques to obtain temperature and velocity distributions in the near field of the thermal discharge. Turbulent quantities were treated through the use of Reynolds stresses with further simplification utilizing the concept of eddy diffusivities computed by Prandtl's mixing length theory. A Richardson number correlation was used to account for the effects of density gradients on the computed diffusivities. Results were obtained for over 100 cases, 66 of which are reported, using the computer program presented in this manuscript. These results ranged from cases of pure buoyancy to pure momentum and for receiving water depths from 1 to 80 discharge diameters deep. Various computed gross aspects of the flow were compared to published data and found to be in excellent agreement. Data for shallow water plumes and the ensuing lateral spread are not readily available; however, one computed surface temperature distribution was compared to proprietary data and found also to be in reasonable agreement. (EPA)
W73-12506

HERBICIDE CONTAMINATION OF SURFACE RUNOFF WATERS,
Utah State Univ., Logan. Dept. of Plant Science.
J. O. Evans, and D. R. Duseja.
Copy available from GPO Sup Doc as EP1.23/2 73-266, $1.25; microfiche from NTIS as PB-222 283, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-266, June 1973. 99 p, 14 fig, 22 tab, 62 ref. EPA Project 13030 FDJ.

Descriptors: *Herbicides, *Weed control, Water pollution sources, Persistence, Urea pesticides, Triazine pesticides, 2-4-D, 2-4-5-T, *Return flow, Path of pollutants, Water quality control.
Identifiers: *Herbicide runoff, *Picloram adsorption, Picloram leaching, Herbicide residues, Herbicide adsorption, Canal bank weed control, Diuron, Picloram.

Field and laboratory studies of the movement of herbicides were conducted to determine their potential as contaminants in irrigation return flow. Special emphasis was given to the use of herbicides for vegetation control along ditches, canals and watersheds where high dosages are required to control the excessive growth of grasses and broadleaved weeds. The following herbicides have been studied: substituted urea (diuron), triazines (summitol and atrazine), phenoxyacetic acid (2,4-D and 2,4,5-T) and a substituted pyridine (picloram). The greatest tendency for transport of herbicides in water coming in contact with soils occurs during the initial storms following spray application. If the intensity of the initial precipitation is not sufficient to cause movement across the soil, the danger of herbicide movement is essentially eliminated. The highest concentrations (ppm) of herbicide observed in surface waters were 1.8, 0.5, 4.2, 1.2 and 2.7 for diuron, summitol, 2,4-D, 2,4,5-T and picloram, respectively. These levels were observed immediately below treated areas receiving the higher recommended dosages of the herbicides. All herbicide concentrations dropped below the limit of detection within a few hundred meters below the sprayed areas. Presumably, soil filtration, adsorption and dilution are primarily responsible for the loss of herbicides from water. (EPA)
W73-12511

AN INVESTIGATION OF THE NITRATE PROBLEM IN RUNNELS COUNTY, TEXAS,
Texas Water Development Board, Austin; and Radian Corp., Austin, Tex.
D. C. Jones.
Copy available from GPO Sup Doc as EP1.23/2:73-267, $2.60; microfiche from NTIS as Pb-222 176, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-267, June 1973. 214 p, 22 fig, 10 tab, 43 ref. EPA Project 16060 HNI.

Descriptors: Groundwater, *Nitrates, Water pollution sources, *Stable isotopes, Soil contamination, Soil chemical properties, Soil leaching, *Remote sensing, Aerial photography, Aquifer characteristics, *Texas.
Identifiers: *Groundwater pollution, *Nitrogen isotope ratio, *Infrared photography, Groundwater age dating.

This report describes the investigation of the nitrate contamination in Runnels County, Texas. It was found that most water well contamination is due to naturally occurring nitrate. However, all the very high nitrate contamination problems (>1000 ppm) are principally due to nitrate from barnyards. The nitrate sources were confirmed utilizing the nitrogen isotope ratio technique. The nitrate contamination was caused by a rising water table which intersected and dissolved nitrate deposits from the soil. The rising water table was caused by a combination of low porosity aquifers, increased infiltration (decreased surface runoff) due to terracing, and several consecutive years of above normal rainfall. There appears to be no economical way to remove the nitrate from either the water or the soil. Recommendations for ways for the area residents to obtain potable water and for a continued monitoring program are included. (EPA)
W73-12514

GROUND WATER POLLUTION IN THE SOUTH CENTRAL STATES,
Robert S. Kerr Environmental Research Lab., Ada, Okla. National Ground Water Research Program.
M. R. Scalf, J. W. Keeley, and C. J. LaFevers.
Copy available from GPO Sup Doc as EP1.23/2:73-268, $2.35; microfiche from NTIS as PB-222 178, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-268, June 1973. 181 p, 23 fig, 15 tab, 385 ref. EPA Project No. 21 A10-03.

Descriptors: *Groundwater, *Water pollution sources, Water resources, Pollution, Oil fields, Brines, Pumping, *Reviews, Bibliographies, *Salinity, Water quality, *Brine disposal, *Waste disposal, Arkansas, Louisiana, New Mexico, Oklahoma, Texas.
Identifiers: *South-central US, Natural pollution.

A study was conducted to determine the groundwater pollution problems in the states of Arkansas, Louisiana, New Mexico, Oklahoma, and Texas. Information was obtained through review of the literature and through interviews with engineers, scientists, and governmental officials concerned with water pollution in the five states of the project area. Natural salinity was the greatest factor affecting the quality of ground water of the region. Disposal of oil-field brines was the most widespread source of man-made pollution. Other causes of groundwater pollution included poor well construction and abandonment procedures, over-pumping, irrigation return flows and land disposal of solid and liquid wastes. (EPA)
W73-12515

OPTIMUM CONDITIONS FOR THE DISCHARGE OF PAPER INDUSTRY EFFLUENTS (OPTIMAL'NOE VODOOTVEDENIE STOKOV BUMAZHNOGO PROIZVODSTVA),
Leningradskii Tekhnologicheskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti (USSR).
For primary bibliographic entry see Field 05G.
W73-12547

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. I. GENERAL AND IN-PLANT MODIFICATIONS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12553

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. II. TESTING METHODS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05A.
W73-12554

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. III. STREAM RESPONSE,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05C.
W73-12555

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. A. PHYSICAL OPERATIONS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12556

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. B. BIOLOGICAL SYSTEMS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12557

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. C. CHEMICAL PROCESSES, GENERAL OBSERVATIONS, AND REPORTS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12558

LEAD POLLUTION; RECORDS IN SOUTHERN CALIFORNIA COASTAL SEDIMENTS,
Scripps Institution of Oceanography, La Jolla, Calif.
T. J. Chow, K. W. Bruland, K. Bertine, A. Soutar, and M. Koide.
Science, Vol 181, No 4099, p 551-552, August 10, 1973. 2 fig, 8 ref. USAEC Grant AT (04-3)-34; NSF Grant GA-26301.

Descriptors: *Path of Pollutants, *Lead, *California, *Bottom sediments, Coastal plains, Heavy metals, Sedimentation, Sedimentation rates.

The present lead fluxes into sediments from the Santa Monica, San Pedro, and Santa Barbara basins of Southern California are, respectively, 0.9, 1.7, and 2.1 micrograms of lead per square centimeter of sea bottom per year; the natural (prepollution) rates for these three basins were, respectively, 0.24, 0.26, and 1.0 microgram of lead per square centimeter per year. Studies of isotopic composition indicate that lead pollutants in coastal sediments are derived mainly from the combustion of lead additives in gasoline. (Knapp-USGS)
W73-12589

LONG-LIVED POLLUTANTS IN SEDIMENTS FROM THE LAGUNA ATASCOSA NATIONAL WILDLIFE REFUGE, TEXAS,
Texas A and M Univ., College Station. Dept. of Geology.
W. M. Ahr.
Geological Society of America Bulletin, Vol 84, No 8, p 2511-2516, August 1973. 4 fig, 11 ref.

Descriptors: *Pesticides, *Path of pollutants, *Lagoons, *DDT, *Texas, Bottom sediments, Pesticide kinetics, Clays, Benthos, Persistence, Pesticide residues, Gulf of Mexico.

DDT and some heavy metals are long-lived pollutants which may be retained in sedimentary layers and may be relocated by postdepositional biological or mechanical processes. Because DDT has a half life of up to 17 yr and it is concentrated in higher ecological levels, even a few parts per billion in the sedimentary substrate can be harmful to wildlife. The Laguna Atascosa National Wildlife Refuge is surrounded by croplands that have been treated extensively with pesticides. Located on the flanks of the Rio Grande delta, the area has ponds, lakes, streams, and lagoons, all of which become settling basins for contaminated sediments. DDT is most abundant near the tops of the core samples and it may be enriched in subsurface clayey layers. Therefore, postdepositional processes have relocated the DDT into secondary host strata. The relocation is attributed to burrowing and mixing by crabs, worms, and other organisms. (Knapp-USGS)
W73-12595

HEAVY METALS IN THE ENVIRONMENT.
Proceedings of Seminar Conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, January 1973. 203 p. OWRR A-999-ORE (14).

Descriptors: *Heavy metals, *Water pollution sources, *Water pollution effects, *Public health, *Conferences, Environmental effects, Air pollution, Trace elements, Water chemistry, Chemical reactions, Toxicity, Hazards, Poisons, Ecology, Ecosystem, Food chains, Human pathology, Animal pathology, Biota.
Identifiers: *Symposium (Oregon State Univ), Pollution tolerance.

To examine pollution of the environment by metals, a seminar series was held at Oregon State University during fall quarter 1972. The seminars were open to the public, faculty, and students. Representatives of federal and state agencies were in attendance. The lectures are reproduced in this volume. The title and author of each paper presented are: Environmental Contamination by Toxic Metals, by D. R. Buhler; Heavy Metals in Estuaries and the Coastal Zone, by N. H. Cutshall; Arsenic and Cadmium in the Environment, by S. L. Wagner; Problems in the Analysis of Trace Metals, by R. H. Filby; Transport of Heavy Metals Through the Air Environment by S. K. Friedlander; Health Standards for Metals in Drinking Water, by R. G. Tardiff; Effect of Heavy Metals on Fish, by G. Chapman; Effects of Metals on Fertilization and Development in Fish, by J. D. McIntyre; The Role of Heavy Metals in Biology, by F. S. Kennedy; and Selenium in the Environment, by P. H. Weswig. (See W73-12605 thru W73-12614) (Woodard-USGS)
W73-12604

ENVIRONMENTAL CONTAMINATION BY TOXIC METALS,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
D. R. Buhler.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, p 1-35, January 1973. 1 fig, 7 tab, 23 ref.

Descriptors: *Heavy metals, *Environmental effects, *Toxicity, *Water pollution sources, *Public health, Air pollution, Ecology, Trace elements, Hazards, Poisons, Ecosystems, Food chains, Pathology.
Identifiers: *Pollution effects.

Concern over environmental pollution by heavy metals has developed because: (1) these elements are widely distributed throughout the environment; (2) they are not degraded and hence persist in nature for extended periods of time; (3) generally, they are toxic to living organisms at fairly low concentrations; (4) they tend to be either biologically magnified or cumulative in plants and animals; and (5) certain metals can be converted to more toxic forms in the environment. While contamination by toxic metals probably affects the entire biota, most attention has focused on the potential risk of metals to man. Metals thought to have adverse effects on human health are summarized. The most hazardous of these metals are arsenic, beryllium, cadmium, lead, mercury, nickel, and selenium. Regardless of the source, most metallic wastes eventually end up in surface and subsurface waters. Liquid wastes containing toxic metals are produced in many industrial operations. In addition to the direct discharge of such wastes, large quantities of many metals which are released into the atmosphere by industrial plants, incinerators, automobiles, etc., are eventually found as water pollutants after sedimentation or after precipitation from the air in rain or snow. (See also W73-12604) (Woodard-USGS)
W73-12605

HEAVY METALS IN ESTUARIES AND THE COASTAL ZONE,
Oregon State Univ., Corvallis. School of Oceanography.
N. H. Cutshall.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, p 37-44, January 1973. 1 fig, 1 tab, 13 ref.

Descriptors: *Water pollution sources, *Estuaries, *Heavy metals, *Coasts, *Path of pollutants, Pollution effects, Ecosystems, Ecology, Ecological distribution, Food chains, Trace elements, Bottom sediments, Biota.

Heavy metals normally occur at very low concentrations in coastal waters. Thus the addition of relatively small quantities of these elements to estuaries can potentially affect the concentrations. As an extreme example, the concentration of beryllium is only 6 x 10 to the minus 8th power grams per liter in seawater. This amounts to about half a cubic foot of the metal in the 200-mile-long Chesapeake Bay, the largest estuary in the United States. Low concentrations of heavy metals in solution are a result of their tendency for sorption on particulate matter including suspended sediment, bed sediment, and small organisms. In some cases, active removal of metals from the water by organisms may also contribute to lowered concentrations in the water. The transport and dilution of heavy metals in coastal systems is therefore affected by the movement of particulate matter as well as by the flow of water. The influence of initial sorption of metals upon their subsequent availability to organisms is one of the most significant problem areas in environmental research. Discussed is the effectiveness of sediments at detoxifying contaminated waters, and the conditions and the degree to which metals in sediments will become incorporated into the biosphere. (See also W73-12604) (Woodard-USGS)
W73-12606

ARSENIC AND CADMIUM IN THE ENVIRONMENT,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
For primary bibliographic entry see Field 05C.
W73-12607

PROBLEMS IN THE ANALYSIS OF TRACE METALS,
Washington State Univ., Pullman. Nuclear Radiation Center.
For primary bibliographic entry see Field 05A.
W73-12608

TRANSPORT OF HEAVY METALS THROUGH THE AIR ENVIRONMENT,
California Inst. of Tech., Pasadena.
S. K. Friedlander.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, p 81-112, January 1973. 9 fig, 2 tab, 20 ref.

Descriptors: *Air pollution, *Heavy metals, *Chemical analysis, Chemical reactions, Atmosphere, Condensation, Evaporation, Coagulation, Sedimentation, Correlation analysis, Model studies, Aerosols, Particle size, Water pollution sources.

A method has been developed for calculating the number and chemical element size distributions of aerosols in a polluted atmosphere based on measured source characteristics and a chemical element balance for collected aerosol samples. The method assumes that: (1) no interaction occurs among primary aerosol emissions, (2) certain simplified models can be used to account for the conversion of secondary sources to the particulate phase, and (3) no modification of the primary emission size distributions occurs except through dilution and the secondary conversion processes. The method has been applied to the Pasadena aerosol and good agreement obtained with measured size and chemical element distributions. (See also W73-12604) (Woodard-USGS)
W73-12609

HEALTH STANDARDS FOR METALS IN DRINKING WATER,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05G.
W73-12610

EFFECT OF HEAVY METALS ON FISH,
National Environmental Research Center, Corvallis, Oreg. Western Fish Toxicology Station.
For primary bibliographic entry see Field 05C.
W73-12611

EFFECTS OF METALS ON FERTILIZATION AND DEVELOPMENT IN FISH,
Oregon Cooperative Fishery Unit, Corvallis.
For primary bibliographic entry see Field 05C.
W73-12612

THE ROLE OF HEAVY METALS IN BIOLOGY,
Harvard Medical School, Boston, Mass.
For primary bibliographic entry see Field 05C.
W73-12613

SELENIUM IN THE ENVIRONMENT,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
For primary bibliographic entry see Field 05C.
W73-12614

NUTRIENTS IN NEBRASKA'S WATERS,
Nebraska Univ., Lincoln. Dept. of Agronomy.
J. Muir, S. Boyce, E. C. Seim, and R. A. Olson.
Farm, Ranch and Home Quarterly, Summer 1973. 3 p, 2 fig. OWRR B-022-NEB (1). 14-31-0001-3908.

Descriptors: *Fertilizers, *Nutrients, *Nitrogen, *Phosphorus, Agricultural chemicals, *Nebraska.

A broad research program is determining the nutrient status and sources of nutrients in Nebraska waters with particular reference to agriculture's role, especially fertilizer use. Basic objectives are to investigate movement of N and P below the root zone under different agricultural management systems. Surface and rain waters also are surveyed relative to these nutrients. Essentially no change in P concentration of groundwater occurred in the 1961-72 period. This is not surprising since even soluble P compounds in fertilizers are rapidly rendered immobile in the soil. Studies indicate that the nutrient content of the groundwater is predominantly related to irrigation and water table depth. In effect, the more irrigation development and the shallower the water table, the greater the nutrient content, accentuated further if soils in the area are largely of sandy texture. Of significant but somewhat lesser import is the magnitude of fertilizer use and of cattle density, with essentially no impact of human density.
W73-12615

DEGRADATION OF METHYLMERCURY BY BACTERIA ISOLATED FROM ENVIRONMENTAL SAMPLES,
Midwest Research Inst. Kansas City, Mo.
For primary bibliographic entry see Field 05A.
W73-12620

SELECTIVE SUBSTRATE UTILIZATION BY MARINE HYDROCARBONOCLASTIC BACTERIA,
Naval Weapons Center, China Lake, Calif. Michelson Labs.
G. Soli, and E. M. Bens.
Biotechnology and Bioengineering, Vol 15, No 2, p 285-297, March 1973. 2 fig, 4 tab, 4 ref.

Descriptors: *Biodegradation, *Marine bacteria, *Oxidation, Oil spills, Oil, Organic compounds, Gas chromatography, Classification, Microbial degradation.

Identifiers: *Crude oil, Substrate utilization, Paraffins, Normal paraffins, Isoparaffins, Aromatic hydrocarbons, Cycloparaffins, Chromatograms, Decalin, Tetralin, 1 3 5-triethylbenzene, Tridecane, 1 3 5-triisoproplybenzene, Bicyclohexyl, Heptylcyclohexane, Farasane, Tetradecane, 2-Ethylnaphthalene, Pentadecane, 1 2-Dimethylnaphthalene, Acenaphthene, Hexadecane, 2 3 6-Trimethylnaphthalene, Flourene, Pristane, Octadecane, Anthracene, Eicosane, Fluoranthene, Pyrene, Tetracosane, Pentacosane, Hexacosane, Squalane, Octacosane, Triasontane.

Several strains of bacteria, isolated from marine environments, were characterized by gas chromatography for their hydrocarbon oxidizing abilities using a complex synthetic mixture of hydrocarbons. Attempts were made at a broad classification of these organisms on the basis of their behavior towards four major groups of hydrocarbons, normal paraffins, iso-paraffins, cyclo-paraffins, and aromatics, known to be present in crude oils. Although bacteria appear to be able to oxidize hydrocarbons at random, this study has shown that it may be possible to recognize a rudimental pattern if their oxidative abilities are viewed in terms of groups of hydrocarbons rather than individual compounds. The action of combined strains on the synthetic hydrocarbon mixture was studied. No particular benefit could be derived as compared to the use of single strains. (Little-Battelle)
W73-12621

PREPARATION AND PROPERTIES OF 3--TRIFLUOROMETHYL-4-AMINOPHENOL,
Medical College of Wisconsin, Milwaukee. Dept. of Pharmacology.
J. J. Lech.
Journal of the Fisheries Research Board of Canada, Vol 30, No 3, p 461-463, March 1973. 2 fig, 2 tab, 3 ref.

Descriptors: *Physiochemical properties, *Methodology, Larvicides, *Phenolic pesticides, Gas chromatography, Halogenated pesticides, Organic compounds, Phenols, Spectrophotometry.
Identifiers: ::±Trifluoromethyl-4-aminophenol, Preparation (Chemical), Dissociation constants, Infrared spectra, Metabolites, Ultraviolet spectra, Chemical composition, Thin layer chromatography, Ultraviolet spectrophotometry, pK, Electron capture gas chromatography, 3-Trifluoromethyl-4-nitrophenol.

A method is described for the preparation of 3-trifluoromethyl-4-aminophenol (RTFM), metabolite of 3-trifluoromethyl-4-nitrophenol (TFM), a selective larvicidal agent used to control the sea lamprey (Petromyzon marinus) in the upper Great Lakes. Some of its physical-chemical properties, including infrared spectrum pK sub a, and gas chromatography, were examined which may aid in the design of analytical procedures for metabolite residues. Generally, the metabolite is prepared from the parent compound by reduction with hydrogen by: (1) dissolving TFM in absolute ethanol to which was added 5 percent palladium on charcoal, (2) reducing the chemical in a Parr apparatus at 60 psi H2, (3) filtering to remove the catalyst, and bubbling HC1 gas through the mixture in an ice bath, and (4) collecting the precipitate by vacuum filtration and washing with ice-cold acetone. The resulting material dried under vacuum and stored under nitrogen is a white fluffy powder which decomposed at 210-220C. Elemental analysis indicated that this material contained 39.19 percent C, 26.95 percent F, and 3.28 percent H. (Holoman-Battelle)
W73-12622

CRUSTACEAN PLANKTON AND THE EUTROPHICATION OF LAKES IN THE OKANAGAN VALLEY, BRITISH COLUMBIA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 05C.

W73-12624

BIOLOGICAL ASPECTS OF LEAD: AN ANNOTATED BIBLIOGRAPHY - LITERATURE FROM 1950 THROUGH 1964. PARTS I AND II,
Cincinnati Univ., Ohio. Coll. of Medicine.
For primary bibliographic entry see Field 05C.
W73-12627

THE EFFECT OF ADSORBENTS ON THE RATE OF DEGRADATION OF HERBICIDES INCUBATED WITH SOIL,
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
J. R. Moyer, R. J. Hance, and C. E. McKone.
Soil Biol Biochem. Vol 4, No 3, p 307-311. 1972.
Identifiers: *Adsorbents, *Degradation rate (Herbicides), *Herbicides, Incubation, *Soils.

The rate of disappearance was followed of atrazine, chlorthiamid and linuron when incubated at 20C with soil and soil containing added charcoal or clay. The presence of clay slightly increased (7.5-38%) the persistence of all compounds, whereas charcoal although increasing the persistence of atrazine and chlorthiamid several fold did not significantly affect that of linuron. Charcoal reduced decomposition rates less than it reduced herbicide concentration in the soil solution.--Copyright 1973, Biological Abstracts, Inc.
W73-12656

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION I,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05G.
W73-12671-1

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION II, PRODUCT LISTING,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05G.
W73-12671-2

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION III, CHEMICAL INGREDIENT LISTING,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05G.
W73-12671-3

THE KINETICS OF MICROBIOLOGICAL MODIFICATION OF ORGANIC SUBSTANCES IN NATURAL WATERS,
Alaska Univ., College. Inst. of Marine Science.
D. K. Button.
Alaska Institute of Water Resources Report No. 31, December 1972. 9 p, 1 tab, append. OWRR A-023-ALAS (1).

Descriptors: *Metabolism, *Microorganisms, *Water chemistry, *Decomposing organic matter, Hydrogen ion concentration, Nutrients, Kinetics, Organic matter, Biochemistry, Absorption, Water purification.
Identifiers: Nutrient removal.

The threshold quantity above which the process of the metabolizing of foreign chemicals in water can occur is set by the facility with which the cellular membranes involved can concentrate the material in question. This process is accomplished by diffusion accompanied by a set of transport systems which recognize a particular species and carry it across the cell wall where it is chemically modified. Since microbial decomposition is a major route or organic material decomposition and the reason dissolved organics do not accumulate, understanding this process is basic to understanding water chemistry. Research yielded several broad generalizations, the most important of which are that substances in small quantities such as vitamins are effectively removed; sediments (clay and glacial flour) do not appreciably affect dissolved nutrient availability; and nutrient removal can be fairly well predicted by a simple, empirically derived equation, justified on the basis of bimolecular collision frequency in liquids. Also, a consistent and unusual response of transport to pH was found. It is the efficiency of this transport system that sets the levels of dissolved metabolites that are kinetically important. A shift of 2 pH units can shut off this process showing that pH is a more important variable than heretofore realized. (Jones-Wisconsin)
W73-12712

THE EFFECT OF LONGITUDINAL DISPERSION ON THE DEOXYGENATION RATE IN POLLUTED STREAMS,
Hydraulic Research Inst., Prague (Czechoslovakia). Surface Water Quality Div.
A. Nejedly.
Journal Water Pollution Control Federation, Vol 45, No 7, p 1601-1605, July 1973. 3 fig, 2 tab, 7 ref.

Descriptors: *Dispersion, *Oxygen sag, *Path of pollutants, Dissolved oxygen, Waste assimilative capacity.
Identifiers: Deoxygenation.

The ratios between stream and laboratory values of the deoxygenation coefficient in two polluted streams were compared with the respective values of the coefficient of longitudinal dispersion as determined by tracer tests. Stream values are consistently higher than laboratory values, and the ratio between stream and laboratory values of the deoxygenation coefficient at the same temperature is directly proportional to the coefficient of longitudinal dispersion. The general form of the relationship between the ratio of the stream value of the deoxygenation coefficient at an arbitrary temperature versus its laboratory value at 20 deg C and the value of the coefficient of longitudinal dispersion was established and formulated. (Knapp-USGS)
W73-12714

MINERAL POLLUTION IN THE COLORADO RIVER BASIN,
Environmental Protection Agency, Phoenix, Ariz. Colorado River Basin Water Quality Control Project.
W. C. Blackman, Jr., J. V. Rouse, G. R. Schillinger, and W. H. Shafer, Jr.
Journal Water Pollution Control Federation, Vol 45, No 7, p 1517-1557, July 1973. 24 fig, 14 tab, 19 ref.

Descriptors: *Salinity, *Water pollution sources, *Colorado River, Irrigation water, Leaching, Salts, Runoff, Chlorides, Bicarbonates.

Concentrations of total dissolved solids (salinity) in Colorado River basin streams are a major problem for lower basin water users. Salinity concentrations in unregulated streams of the basin comprise two distinct populations that are grouped into base flow months and runoff months. Statistically significant increases in salinity have occurred with increasing water use, and in downstream progression. Upper basin salt load contributions are: runoff, 52 percent; irrigated agriculture, 37 percent; natural point sources and flowing wells, 9 percent; and municipal and industrial, 7 percent. Lower basin contributors are: upper basin inflow, 72 percent; natural point sources, 15 percent; irrigated agriculture, 9 percent; runoff, 4 percent, and municipal and industrial, less than 1 percent. Salt yields from irrigated lands range from near 0 to 8.5 tons/yr/acre. Greatest yields are from irrigation of and runoff from lands underlain by Mancos shale and Tertiary lake beds. Headwater areas yield predominantly calcium bicarbonate waters. Saline sediments in lower valleys cause waters to become predominantly high in sodium calcium sulfate ions. (Knapp-USGS)
W73-12715

FACTORS AFFECTING THE PERCOLATION TEST,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
K. A. Healy, and R. Laak.
Journal Water Pollution Control Federation, Vol 45, No 7, p 1508-1516, July 1973. 10 fig, 2 tab, 5 ref.

Descriptors: *Infiltration, *Percolation, *Septic tanks, Soil disposal fields.
Identifiers: *Percolation tests.

A mathematical analysis of the percolation test is presented with both capillary and gravity flow potentials considered. A relation between percolation rate, capillarity, hole shape, and permeability is developed. Laboratory percolation tests qualitatively support the analysis. Field percolation tests show no correlation between percolation rate, permeability, or position of the water table. The percolation test seems to be an unreliable method of determining the water absorption capability of a soil deposit. (Knapp-USGS)
W73-12716

LIPIDS IN SHALLOW BOTTOM SEDIMENTS,
Harvard Univ., Cambridge, Mass. Dept. of Chemistry.
D. G. Shaw.
Environmental Science and Technology, Vol 7, No 8, p 740-742, August 1973. 1 fig, 8 ref.

Descriptors: *Bottom sediments, *Estuaries, *Massachusetts, *Lipids, Harbors, Organic compounds, Oil wastes, Oil spills, Path of pollutants, Water pollution sources, Adsorption, Waste water (Pollution), Sewage sludge, Distribution patterns.
Identifiers: *Boston Harbor.

Sediments from the bottom of Boston Harbor and vicinity were analyzed for lipids by gas chromatography. A petroleum-like fraction was associated with sewage sludge dumped into the harbor and with bottom deposits of similar sludge-like mud. However, samples of silt and clay collected in adjacent areas showed no evidence of petroleum at comparable concentrations. The difference in lipid content of the various sediments reflects the complexity of estuarine sedimentation processes and are absorption of organic materials onto sediments. (Knapp-USGS)
W73-12717

PREDICTION OF UNSTEADY SALINITY INTRUSION IN ESTUARIES: MATHEMATICAL MODEL AND USER'S MANUAL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02L.
W73-12728

PROBLEMS OF GROUNDWATER POLLUTION BY BRINE,
Public Health Service, Dallas, Tex. Region VII.
J. W. Keeley.
Public Works, Vol 97, No 3, p 149, 158, 160, 162, March 1966.

Descriptors: *Water pollution sources, Pollution, Wells, *Waste water disposal, *Brine disposal, Aquifers, Oil wells, Injection wells.
Identifiers: Well sealing, Cementing, *Surface pits.

Numerous complaints have been registered concerning salt water pollution in rural water wells, and there is growing concern for the protection of major aquifers from which municipal water supplies are drawn. Described is the development of procedures which can be extended from an area of investigation to the entire problem area by interested parties. These procedures help to determine methods by which brine pollution sources and polluted water sources can be located, point out threatened fresh water sources that need protection, find ways to properly seal old and new wells, and present information and advice upon which state agencies can prepare necessary legislation for the prevention of brine pollution. (Campbell-NWWA)
W73-12770

NEW APPLICATIONS OF GEOPHYSICAL METHODS TO GROUND-WATER PROBLEMS IN PENNSYLVANIA,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 02F.
W73-12783

BIOLOGICALLY ACTIVE COMPOUNDS IN THE AQUATIC ENVIRONMENT: THE UPTAKE AND DISTRIBUTION OF (1,1-DICHLORO-2-,2-BIS (P-CHLOROPHENYL) ETHYLENE), DDE BY CHIRONOMUS TENTANS FABRICIUS (DIPTERA: CHIRONOMIDAE),
Michigan State Univ., East Lansing. Dept. of Entomology.
S. K. Derr, and M. J. Zabik.
Trans Am Fish Soc. Vol 101, No 2, p 323-329. 1972. Illus.
Identifiers: Aquatic enviroment, *Chironomidae, Chironomus-Tentans, *DDE, Diptera, Distribution patterns, *Midges.

The midge, C. tentans was exposed from egg through adult to varying concentrations (.07-2.2 ppb) of (1,1-dichloro-2,2-bis (P-chlorophenyl) ethylene), DDE. The amount of DDE accumulated by the midge was determined by gas-liquid chromatography. The accumulation of DDE from aqueous solution and contaminated substrate by the midge as a function of DDE concentration and exposure time was determined, and the distribution of the accumulated DDE residue was quantitated (pupa, exuvia, adult and egg mass). No attempt was made to differentiate between these 2 modes of uptake (water or substrate). The DDE accumulation by the midge demonstrated a dose-dependent relationship, accumulating DDE exponentially with increased concentration at a given exposure time. At any given concentration of DDE in the water, accumulation increased with increased exposure time. On a ppm basis the midges concentrated DDE approximately 20,000 times over that level which was present in the water. The exuvia did not demonstrate a major route of residue elimination as only 1.4 to 4.9% of the pupal burden was lost via the exuviae. The process of egg deposition eliminated 11.6 to 30.9% of the adult female burden of DDE residue.--Copyright 1973, Biological Abstracts, Inc.
W73-12804

MERCURY LEVELS IN WISCONSIN FISH AND WILDLIFE,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 05A.
W73-12812

PHOTOSULFOXIDATION OF HYDROCARBONS IN THE LIQUID PHASE,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 02K.
W73-12833

DDT RESIDUES IN WHITE CROAKERS,
California State Dept. of Fish and Game, Sacramento.
For primary bibliographic entry see Field 05C.
W73-12835

THE NITROGEN CYCLE IN SEDIMENT-WATER SYSTEMS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 05C.
W73-12843

CARBON CYCLE IN SEDIMENT-WATER SYSTEMS,
National Environmental Research Center, Corvallis, Oreg.
For primary bibliographic entry see Field 05C.
W73-12846

FLOW OF MICROBIALLY FIXED NITROGEN IN A MODEL ECOSYSTEM,
Oak Ridge National Lab., Tenn.
S. A. Visser, M. Witkamp, and R. C. Dahlman.
Plant and Soil, Vol 38, No 1, p 1-8, February 1973. 3 fig, 1 tab, 6 ref.

Descriptors: *Nitrogen fixation, *Azotobacter, *Nitrogen fixing bacteria, *Path of pollutants, Nitrification, Ecosystems, Mass spectrometry, Computer models, Cycling nutrients, Nitrogen, Aquatic plants, Cultures, Kaolinite, Centrifugation, Incubation, Clays, Anaerobic conditions, Nitrogen cycle, Radioactivity techniques.
Identifiers: Fate of pollutants, Culturing techniques, Acidification, Duckweed, Kjeldahl procedure, Nitrogen radioisotopes, Azotobacter chroococcum, Culture media.

Transfer of atmospheric nitrogen through microbial fixers, a green plant, decomposer microflora, water and soil was measured in model ecosystems. The systems were maintained under controlled conditions in a 50-ml respirometer flask and consisted of 10 g of kaolinite, 10 ml of water, 60 duckweed leaves (Lemna minor), and a mixed microflora or pure Azotobacter chroococcum. The role of the Azotobacter in fixation was assessed by comparing the nitrogen flow in systems with nitrogen fixers only and those with both nitrogen fixers and decomposers. Analog computer simulations were used to compare N-15 transfer from the atmosphere with net changes of all nitrogen in all compartments. Results showed that Azotobacter and the mixed flora with Azotobacter are about equally capable of fixing atmospheric nitrogen. During subsequent transfer of the nitrogen there was a distinct differentiation between movement of the newly fixed nitrogen and the nitrogen that was already present in tissues introduced in the beginning of the experiment. Pathways and transfer coefficients of both N-14 and N-15 were different in the presence of the different microbial populations. Turnover was more complex and in general slower in the presence of a mixed population than with pure Azotobacter. Denitrification losses upon adicification were negligible for N-14 but appreciable for N-15. (Mortland-Battelle)
W73-12847

AROMATIC HYDROXYLATION AS AN ANALYTICAL REACTION,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05A.
W73-12853

PARTICULATE MANGANESE IN SEA WATER STRESSING REGIMES IN MARINE ANOXIC BASINS,
Washington Univ., Seattle.
For primary bibliographic entry see Field 05A.
W73-12854

NITROGEN RELEASE FROM LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Program.
E. R. Austin, and G. F. Lee.
Journal Water Pollution Control Federation, Vol 45, No 5, p 870-879, May 1973. 7 fig, 4 tab, 10 ref.

Descriptors: *Lake sediments, *Nitrogen, *Nitrogen compounds, Anaerobic conditions, Aerobic conditions, Mixing, Shallow water, Deep water, Laboratory tests, *Wisconsin, Nitrates, Nitrites, Trophic level, Oligotrophy, Mesotrophy, Bottom sampling, Bottom sediments, Ammonia.
Identifiers: *Lake Mendota, *Lake Trout, *Nitrogen release, Chemical composition, Kjeldahl nitrogen, Ammonium, Ekman dredge, Organic nitrogen.

A study was made of the release of nitrogen compounds from two Wisconsin lakes sediments that were completely mixed with the water at all times. Ekman dredge sediment samples were taken from the shallow (5 m) and deep (22 m) areas of Lake Mendota, and the deeper areas (27-32 m) of Lake Trout. Under aerobic conditions, over 49 percent of the total nitrogen present in one sample was released as soluble organic nitrogen, ammonia, and nitrate in approximately 200 days. Under anaerobic conditions, these sediments released about 6 percent of the nitrogen in a similar period of time. Sediments from the second lake released 5 and 2 percent, respectively, of the potentially released nitrogen in 100 days under aerobic and unaerobic conditions. Similar tests conducted on unstirred sediments showed that the amount of mixing was probably one of the controlling factors of nitrogen release. (Holoman-Battelle)
W73-12860

LITHIUM SILICATE SEDIMENTATION TRACER FOR SHOAL DEPOSIT STUDIES,
IIT Research Inst., Chicago, Ill.
T. K. Nedved, E. G. Fochtman, W. M. Langdon, and F. O. Sullivan.
Journal Water Pollution Control Federation, Vol 45, No 5, p 896-904, May 1973. 8 fig, 1 tab, 1 ref.

Descriptors: *Tracers, *Shoals, *Sedimentation, Suspended solids, Distribution patterns, Tracking techniques, *Path of pollutants, Sedimentation rates, Sediments, Water pollution effects, Water pollution sources, Sampling, Density, Rivers, Dispersion, *Illinois, Industrial wastes, Radioactivity techniques, On-site tests, Organic matter, Iron oxide.
Identifiers: Lithium silicate, *Calumet River (Ill.), Proton capture technique, Settleable solids, Acid insoluble material.

Investigations were conducted on a 12-mile section of the Calumet River to determine the relationships between the suspended solids discharges by outfalls and the buildup of shoals in a waterway. Shoal soundings were used to determine the long-term overall rate of shoal buildup, as well as the volume and distribution of the shoal material in a selected study area. The data indicated an average rate of shoal buildup of 0.19 ft/ month. The shoals were sampled extensively to determine the physical and chemical properties of the deposited materials. The wet density of the shoals in the area averaged 87 lb/cu ft. The ss concentration of the river in the immediate vicinity of the study outfall indicated rapid disperison of the materials discharged. These surveys further demonstrated the extreme complexities of the processes involved in shoal buildups in this particular area. Techniques were developed for quantitative tracing of the contribution of a particular discharge to the formation of shoals. Lithium metasilicate was used as the tracer material. A proton-capture technique was used to assay for the lithium. Special pan type sedimentation samplers were designed, constructed, and used in a field demonstration study. This investigation indicated that the suspended matter discharged by

the study outfall traveled considerably in both the upstream and downstream directions. Although only 30 percent of the tracer material was recovered, this study amply demonstrated that lithium metasilicate could be used successfully as a sedimentation tracer. (Little-Battelle)
W73-12862

STREAM-VELOCITY EFFECTS ON THE HEAVY-METAL CONCENTRATIONS,
Alabama Univ., University. Dept. of Biology.
L. G. Williams, J. C. Joyce, and J. T. Monk, Jr.
Journal of the American Water Works Association, Vol 65, No 4, p 275-279, April 1973. 3 fig, 2 tab, 8 ref.

Descriptors: *Heavy metals, *Suspended solids, *Toxicity, *Biological communities, Cadmium, Chromium, Copper, Mercury, Manganese, Zinc, Iron, Runoff, Scour, Sampling, Water analysis, Industrial wastes, Flow rates, Sediments, Suspension, Water pollution effects, Fish Zooplankton, Phytoplankton, Organic matter, Flocculation, Separation techniques, Path of pollutants, Bacteria, Alabama.
Identifiers: *Atomic absorption spectrophotometry, Transport, Black Warrior River, Sample preparation, Resuspension.

Water samples were collected twice weekly in two 20-liter polyethylene jugs from the Black Warrior River and three of its tributaries from February 17 to October 6, 1971. One sample was flocculated by the addition of aluminum ammonium sulfate to remove suspended matter; suspended matter from the other was concentrated by siphoning the sample through a 60 millimicron screen and settling. Samples were digested and analyzed for Cd, Cr, Cu, Hg, Mn, Zn, and Fe by atomic absorption spectrophotometry. River flow rates were also monitored. No correlation was found to exist between streamflow and the soluble concentrations of the selected heavy metals. However, a strong positive correlation did exist between the concentration of these metals and the resuspended bottom sediments, mostly in the form of ooze deposits, present in the water column following increased flow and scour from heavy rain runoff. Copper, iron, manganese, mercury, and zinc concentrations were associated with oooze sediments that accumulated during periods of low or negligible streamflow and were resuspended into the water column following scours in a complex that was destructive to favorable balance of river biota and produced slugs of water unfit for good domestic supply. Suspended particles larger than 60 millimicrons that were screened from the water samples were mostly organic and held the highest concentrations of the selected metals, whereas inorganic large particles had relatively low carrying power. (Little-Battelle)
W73-12870

THE MECHANISMS OF NITROGEN ASSIMILATION IN PSEUDOMONADS,
Newcastle-upon-Tyne Univ. (England). Dept. of Microbiology.
For primary bibliographic entry see Field 05C.
W73-12881

THE UTILIZATION OF LEAF LITTER BY STREAM DETRITIVORES,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 05C.
W73-12882

DISPERSION, DISPERSAL, AND PERSISTENCE OF THE ANNUAL INTERTIDAL ALGA, POSTELSIA PALMEFORMIS RUPRECHT,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05C.
W73-12883

INSECTICIDE RESIDUES IN WATER AND SEDIMENT FROM CISTERNS ON THE U.S. AND BRITISH VIRGIN ISLANDS - 1970,
Central Michigan Univ., Mount Pleasant. Dept. of Biology.
H. Lenon, L. Curry, A. Miller, and D. Patulski.
Pesticides Monitoring Journal, Vol 6, No 3, p 188-193, December 1972. 5 fig, 5 tab, 6 ref.

Descriptors: *Water analysis, *Sediments, *Cisterns, *Gas chromatography, DDT, DDD, DDE, Dieldrin, Sampling, Separation techniques, *Pesticide residues, *Insecticides.
Identifiers: *Virgin Islands, Malathion, Sample preparation, Electron capture gas chromatography.

Samples of water and sediment were collected from cisterns in four of the Virgin Islands during February and March, 1970, to be analyzed for pesticides. Water samples were collected in glass bottles, extracted by liquid-liquid partitioning with purified petroleum ether, partially evaporated, sealed in vials, and mailed to Michigan for analysis. Before analysis samples were dried with anhydrous sodium sulfate, partially evaporated and adjusted to 25 ml. Sediment samples were collected with a plankton net and mailed in screw-capped bottles. These were filtered the filter containing the sediment dried and the sediment extracted with petroleum ether. Sediment extracts were prepared the same as water extracts. All samples were analyzed for DDE, DDD, DDT, dieldrin, and malathion by electron capture gas chromatography. Evidence of an unknown malathion metabolite was found in all 49 water samples analyzed, whereas malathion was found in only two (0.01 and 0.14 ppb). DDT, its metabolites, and dieldrin were not commonly found in the water samples except those from St. John where dieldrin was detected in approximately 50 percent of the samples (average concentration-0.19 ppb). Sediment samples from cisterns, in general, contained much higher concentrations of pesticides than water, with DDT and its metabolites occurring most frequently. In many of these sediment samples, the residue levels were high enough to be of concern. As a result it is strongly recommended that cisterns be cleaned frequently to remove sediment. (Little-Battelle)
W73-12894

ANNUAL LIFE CYCLE AND PRODUCTION OF THE CHAETOGNATH SAGITTA ELEGANS IN BEDFORD BASIN, NOVA SCOTIA,
Bedford Inst., Dartmouth (Nova Scotia).
D. D. Sameoto.
Journal of the Fisheries Research Board of Canada, Vol 30, No 3, p 333-344, March 1973. 7 fig, 6 tab, 7 ref.

Descriptors: *Secondary productivity, *Zooplankton, *Life cycles, *Biomass, *Canada, Growth rates, Energy budget, Growth stages, Annual turnover, Animal growth, Water temperature, Sampling, Copepods, Least squares methods, Regression analysis, Invertebrates.
Identifiers: *Chaetognaths, Sagitta elegans, *Bedford Basin (N.S.), Eggs, Food sources, Correlation coefficients, St. Margaret's Bay.

A study has been made on the population of Sagitta elegans in Bedford Basin for which comparable data on the basic production system are available (Sameoto, 1971). Horizontal and oblique samples of zooplankton were taken after dark at five stations inside and two stations outside the Basin. The samples were analyzed within a week of collection. S. elegans over 5 mm long were removed, counted, and weighed after blotting on filter paper. The remaining sample was split and the stages of S. elegans less than 5 mm were counted. Free water was removed from the sample of copepods obtained upon sorting and the sample weighed to obtain a biomass estimate. The method used to stage the animals and analyze the different modes of the S. elegans population was that used by Sameoto (1971). In Bedford Basin, Nova Scotia, Sagitta elegans has two main generations per year, one in the spring and one in the fall. The biomass of S. elegans per 100 cu m of water was an order of magnitude greater in the Basin than that reported previously for St. Margaret's Bay, N.S. The growth rate and the number of degree days needed to mature were similar to those found for S. elegans in St. Margaret's Bay. Annual turnover rate for S. elegans in the Basin was 5.6 and yearly production was estimated at 27.0 kcal per year or 9.0 percent of the yearly copepod production. It was calculated that the species used 90.4 kcal per sq m per year in respiration. The percentage of the total yearly production of copepods consumed by S. elegans was estimated at 36 percent. (Holoman-Battelle)
W73-12898

A RELATIONSHIP BETWEEN HETEROTROPHIC UTILIZATION OF ORGANIC ACIDS AND BACTERIAL POPULATIONS IN WEST BLUE LAKE, MANITOBA,
Manitoba Univ., Winnipeg. Dept. of Botany.
For primary bibliographic entry see Field 05C.
W73-12903

THE CHARACTERIZATION OF SOLUBLE PHOSPHORUS RELEASED BY LIMNETIC ZOOPLANKTON,
Toronto Univ. (Ontario). Dept. of Zoology.
R. Peters, and D. Lean.
Limnology and Oceanography, Vol 18, No 2, p 270-279, March 1973. 6 fig, 3 tab, 17 ref.

Descriptors: *Phosphorus, *Zooplankton, *Pollutant identification, *Radiochemical analysis, Phosphates, Waterfleas, Copepods, Radioactivity techniques, Cycling nutrients, Phosphorus radioisotopes, Anion exchange, Seston, Absorption, Solubility.
Identifiers: Characterization, Orthophosphates, Nutrient availability, Diaptomus minutus, Daphnia rosea, P-32, Gel filtration chromatography, Molybdates, Phosphorus cycle.

Three rapid techniques were used to characterize the main forms of soluble phosphate released by Daphnia rosea. Uniformly P-32-labeled laboratory animals were transferred to nonradioactive water and most of the soluble radiophosphorus was shown to be similar to PO4 in anion exchange, in gel filtration chromatography, and in a kinetic analysis of incorporation by natural seston. In addition, Diaptomus minutus was labeled in situ with P-32 and its release products compared to PO4 by gel filtration. This analysis and those using Daphnia indicated that the released soluble phosphorus was about 90 percent orthophosphate. However, molybdate analyses of the soluble phosphates released in a 10-hr experiment showed them to be only 60 percent orthophosphate. Net reuptake of orthophosphate was insufficient to account for this discrepancy. Recycling of phosphorus is postualted in longer experiments, which leads to a substantial underestimate of the orthophosphate release. (Holoman-Battelle)
W73-12904

ANNUAL PRODUCTION OF A STREAM MAYFLY POPULATION: A COMPARISON OF METHODS,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
T. F. Waters, and G. W. Crawford.
Limnology and Oceanography, Vol 18, No 2, p 286-296, March 1973. 6 fig, 5 tab, 31 ref.

Descriptors: *Mayflies, *Standing crops, *Secondary productivity, *Animal growth, *Methodology, Growth rates, Bottom sampling, Aquatic in-

sects, Annual, Life history studies, Annual turnover, *Minnesota.
Identifiers: *Comparative studies, Removal summation method, Instantaneous growth method, Allen curve method, Hynes method, Method evaluation, Data interpretation, Ephemerella subvaria.

The annual production of the mayfly Ephemerella subvaria McDunnough in a small central Minnesota stream, Luxembury Creek, was estimated by four methods: a removal-summation method, the instantaneous growth method, the Allen curve, and the Hynes method. Basic data on standing crop and growth rates were obtained from a series of bottom samples covering the life cycle of the mayfly. The life history of E. subvaria was clear and simple, and the data were particularly amenable to production estimation by all four methods. The first three yielded estimates of annual production that generally agreed, ranging from 26.4 to 28.9 g/sq m. The Hynes method yielded an estimate 15.2 to 26.1 percent higher, or 33.3 g/sq m. Cohort turnover ratios for the first three methods ranged from 4.2 to 4.6 (not calcuable for the Hynes method); the annual turnover ratio for the first three methods ranged from 5.8 to 6.3 and was 7.2 for the Hynes method. (Mortland-Battelle)
W73-12905

BACTERIAL CONTENT OF PARTICULATE MATTER IN OFFSHORE SURFACE WATERS,
Woods Hole Oceanographic Institution, Mass.
H. W. Jannasch.
Limnology and Oceanography, Vol 18, No 2, p 340-342, March 1973. 1 tab, 7 ref.

Descriptors: *Sea water, *Organic matter, *Marine bacteria, Surface waters, Carbon, Cultures, Filtration, Water sampling, Methodology.
Identifiers: *Sargasso Sea, *Particulate matter, Heterotrophic bacteria, Culturing techniques, Sample preparation.

During a cruise in the Sargasso Sea, flakelike particles swirling up with the surface waves motion were encountered. These particles showed intense iridescence and it required more than an hour at a speed of 11-12 knots to sail out of them. Because the particles would disintegrate with only slight disturbance of the water, they were very difficult to sample. Methods were devised to obtain small samples of small size particles. Subsamples were shaken vigorously, streaked on agar plates, membrane filtered, and incubated on the same agar medium at 22 plus or minus 1 C for 4 days. The data taken from these cultures indicated the absence of attached bacteria and made it appear unlikely that the particulate material was inhibitory to bacterial growth or attachment. This was interpreted as an indication that the particles were of relatively recent origin and in a labile state. (Mortland-Battelle)
W73-12912

A MATHEMATICAL MODEL OF THE NUTRIENT DYNAMICS OF PHYTOPLANKTON IN A NITRATE-LIMITED ENVIRONMENT,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 05C.
W73-12915

SIMULATION STUDY OF PHYTOPLANKTON PHOTOSYNTHESIS AND GROWTH IN THE FRASER RIVER ESTUARY,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 05C.
W73-12919

MERCURY DISTRIBUTION IN ESTUARINE-NEARSHORE ENVIRONMENT,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. L. Windom.
Journal of the Waterways Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 99, No WW2, p 257-265, May 1973. 5 fig, 2 tab, 6 ref.

Descriptors: *Estuarine environment, *Mercury, *Path of pollutants, Estuaries, Rivers, Bottom sediments, Plant tissues, Plankton, Water pollution, Salt marshes, Heavy metals, Coastal marshes, Marsh plants, Distribution, Pollutants, Water sampling, Bottom sampling, Absorption, Chemical analysis, Salinity, Water analysis, Suspended sediments, Sedimentation, Rhizomes, Root systems, Leaves.
Identifiers: *Nearshore waters, Spartina alterniflora, Reduction aeration flameless atomic absorption, Flameless atomic absorption spectrophotometry, Marsh grass.

Samples of estuarine and nearshore waters were collected in the area of the southeastern United States between Cape Romani, South Carolina and Jacksonville, Florida for mercury analysis by the reduction aeration flameless atomic absorption technique. Samples of Spartina alterniflora were taken from 2 areas of different salinity; sediment cores were also taken from those areas and from adjacent channels for comparison. Plankton samples were from surface waters nearshore and offshore of the northeast and southeast U.S. coast. All mercury samples were analyzed as the water samples. It was found that the transfer of mercury through an estuarine system of the Southeastern Atlantic Coast to the open ocean is controlled by: (1) mixing of estuarine waters with offshore waters; (2) loss in plant detritus due to rafting offshore; (3) migration of estuarine organisms to offshore areas. An additional loss of mercury from the estuarine system is due to sedimentation. A budget of mercury for estuaries along the Georgia Coast indicates that the dominant salt marsh plant, Spartina alterniflora, exerts a strong control on the migration of this metal. Mercury enters the estuary primarily in solution, delivering approximately 1.5 mg annually to each square meter of salt marsh. The annual uptake of mercury by the plant is approximately 0.7 mb/sq m of salt marsh. (Holoman-Battelle)
W73-12920

POLIOVIRUS IN A WATER SUPPLY,
Michigan Dpt. of Public Health, Lansing. Bureau of Environmental Health.
T. L. Vander Velde, and T. C. Broyer.
Journal of the American Water Works Association, Vol 65, No 5, p 345-348, May 1973. 4 tab, 2 fig.

Descriptors: *Isolation, Water pollution sources, *Water supply, *Drainage wells, Waste water (Pollution), *Potable water, *Sewerage, Methodology, Environmental effects, E. coli, Bioindicators, Pollutant identification, *Viruses, Coliforms, Chlorination, Chlorine, Water sampling, Electron microscopy, Centrifugation, *Michigan.
Identifiers: *Poliovirus, Culture media, Red Cedar River, Selective media, Sample preparation.

This is a two-part paper concerning the isolation of poliovirus from well water in Monroe County, Michigan. The first article considers construction of the well, geological features of the area, and the operation from which water samples were taken. The second article discusses laboratory and research techniques involved in the isolation of the poliovirus. A 5-gallon sample was taken from the well and divided into two equal volume. Fifty ml of water were removed from each sample and 10 ml were used to seed five tubes of lauryl sulfate double-strength broth to detect coliforms. Two samples were concentrated on the ultracentrifuge and tested for virus on green, African-monkey kidney-cell cultures. A virus was isolated and identified as poliovirus 2. E. coli was recovered from the concentrated samples. The tests indicated that viruses are viable and can survive where bacteria do not. In this case, there was little evidence of contamination and it required a great deal of concentration of the samples before the coli organisms and the virus were detected. (Mortland-Battelle)
W73-12922

INVESTIGATION OF THE ENVIRONMENTAL FACTORS WHICH AFFECT THE ANAEROBIC DECOMPOSITION OF FIBROUS SLUDGE BEDS ON STREAM BOTTOMS,
Lawrence Univ., Appleton, Wis.
A. M. Springer.
Available from--Univ. Microfilms, Inc., Ann Arbor, Mich. 48106. Order No. 73-7,166. Ph D Dissertation, 1972. 178 p.

Descriptors: *Distribution, *Biodegradation, *Pulp wastes, Fibers (Plant), Cellulose, Mathematical models, Energy budget, Pulp and paper industry, Sludge, Sludge digestion, Water temperature, *Wisconsin.
Identifiers: *Fox River (Wis), Glucose, Cellobiose.

Redistribution and decomposition of fibrous sludge from paper mills have been studied in the lower Fox River between Lake Winnebago and Green Bay, Wisconsin. In June 1970 approximately 50 percent of the river bottom was covered with fibrous sludge to a depth which ranged from six inches to several feet. A mathematical model was developed to predict sludge distribution, and it appeared to depict actual river conditions quite well. Approximately 4/5 of the lower Fox River is subject to sludge deposition, scour, and redistribution; while the remaining 1/5 is either always free of sludge or contains permanent beds. The principal mechanism for sludge bed destruction is decomposition, since scour and flotation merely relocate the sludge at another position in the river. A linear temperature profile is found in the bed, indicating that the energy generated by the decomposition process is negligible in comparison to that conducted in from outside the bed. Laboratory studies demonstrated that anaerobic decomposition is the principal mechanism for the destruction of organic matter in a sludge bed. Chemical pulps anaerobically decompose faster than do groundwood pulps of similar surface-to-volume ratios by a factor of about two. The rate-limiting step in the anaerobic decomposition process is the breakdown of cellulose into glucose and/or cellobiose. Temperature has an appreciable effect on the rate of fibrous sludge anaerobic decomposition. Appreciable differences in rate of decomposition occur at different river locations and at different times of the year in the same location. The life of a fibrous sludge bed in the lower Fox River would be one to two years if no new material were added to the bed. (Little-Battelle)
W73-12936

TRACE ELEMENT TRAPPING IN PTEROPOD TESTS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
K. K. Turekian, A. Katz, and L. Chan.
Limnology and Oceanography, Vol 18, No 2, p 240-249, March 1973. 3 fig, 3 tab, 15 ref.

Descriptors: *Trace elements, *Absorption, *Plankton, *Transport depletion, Gastropods, Sea water, Heavy metals, Path of pollutants, Neutron activation analysis, Chemical analysis, Atlantic Ocean, Mollusks, Invertebrates, Iron, Chromium, Cobalt, Kinetics, Methodology.
Identifiers: *Instrumental neutron activation analysis, *Pteropods, *Shells, Rare earth elements, Fate of pollutants, Detection limits, Sample preparation, Lanthanum, Samarium, Europium, Thorium, Scandium, Antimony, Selenium, Particulate matter, *Gulf of Aqaba, Cerium, Long Island Sound, Cavolinia quadridentata, Clio pyramidata, Cavolinia unicata, Creseis acicula, Styliola tubula, Limacina retroversa.

Pteropod tests from the Gulf of Aqaba and the South Atlantic Ocean and 'bulk' (soft tissue) plankton samples from Long Island Sound were analyzed by instrumental neutron activation analysis (INAA) for 11 trace metals (Fe, Ce, La, Sm, Eu, Th, Sc, Cr, Co, Sb, Se) to study the trapping and transport mechanisms for these metals in the oceans and the capability of pteropods to modify the composition of seawater during this process. The internal correlations among these metals strongly suggest that a finely particulate (less than 0.2 micron) authigenic iron-rich phase (hydrated oxide or phosphate) is trapped by both the soft and hard tissues of plankton and that this phase is the major carrier of several of the trace metals. Assuming that the iron-rich floc-trapping mechanism is applicable to all pelagic calcareous tests, then the downward flux of iron and associated trace elements carried by these tests can be assessed. This assumption leads to the conclusion that the iron and the associated trace elements have residence times in the deep water of the same order of magnitude as that of the deep water itself. (Holoman-Battelle)
W73-12937

BACTERIAL DEGRADATION OF DETERGENT COMPOUNDS,
Missouri Univ., Columbia. Div. of Biological Sciences.
R. A. Goodnow, and A. P. Harrison, Jr.
Applied Microbiology, Vol 24, No 4, p 555-560, October 1972. 3 tab, 6 ref.

Descriptors: *Surfactants, *Microbial degradation, *Detergents, Biodegradation, Aerobic bacteria, Assay, Linear alkylate sulfonates, Water pollution, E. coli, Pollutants, Pathogenic bacteria, Coliforms.
Identifiers: *Bacterial physiology, *Fate of pollutants, Tallow alkyl sulfate, Alkyl ethoxylate sulfate, Culture media, Substrate utilization.

A survey for surfactant degradation among aerobic bacteria has been undertaken. Tests have been made in peptone medium where such a degradation, if it occurs, will be gratuitous. Tallow-alkyl-sulfate, alkyl-ethoxylate-sulfate, and linear-alkyl-benzene-sulfonate were used. Forty-five strains of 34 species in 19 genera degrade one or more of these detergent compounds. With some species, the surfactant inhibits degradation without inhibiting growth, whereas with one species slight degradation took place even at a toxic concentration of surfactant. (Holoman-Battelle)
W73-12938

SALT POLLUTION OF A SHALLOW AQUIFER--INDIANAPOLIS, INDIANA,
Indiana State Univ., Terre Haute. Dept. of Geography and Geology.
H. W. Dennis.
Ground Water, Vol 11, No 4, p 18-22, July-August 1973. 5 fig, 1 tab, 6 ref.

Descriptors: *Water pollution sources, *Groundwater movement, *Path of pollutants, *Salts, Saline water, Sodium chloride, Deicers, Salinity, Indiana.
Identifiers: *Indianapolis.

Runoff from large quantities of deicing salts can contaminate groundwater. Tests of water samples from shallow wells in 1967, 1968, and 1973 document the loss of a water supply in an Indianapolis, Indiana, suburban housing development. In 1966 a salt company taking advantage of the location relative to the transportation net of the region, established a distribution point for highway deicing salts at Stout Field in Indianapolis, Indiana. The salts, only partially protected from the elements, were stored on the southwest end of the abandoned southwest-northeast runway. Runoff from any freshet or storm carried salt to the south and contaminated a shallow aquifer. Investigations by State and city health officials led to removal of the salt. With the salt removed, the same processes which led to the problem aided in flushing and dilution of the high chloride water. In a little over a year's time, dilution by rapid recharge of storm water into the shallow aquifer had reduced the chloride content of the water to a palatable level. Five years after the salt was removed, the chloride level is approaching acceptable limits. (Knapp-USGS)
W73-12940

RADIOCHEMICAL MONITORING OF WATER AFTER THE CANNIKIN EVENT, AMCHITKA ISLAND, ALASKA, OCTOBER, 1972,
Geological Survey, Lakewood, Colo.
L. J. Schroder, and W. C. Ballance.
Available from NTIS, Springfield, Va 22151 as USGS-474-169, Price $4.00 printed copy; $1.45 microfiche. Report USGS-474-169 (Amchitka-40), May 1973. 15 p, 3 fig, 2 tab, 5 ref. AEC Contract AT (29-2)-474.

Descriptors: *Nuclear explosions, *Radiochemical analysis, *Alaska, *Water pollution sources, Tritium, Water analysis, Correlation analysis, Water quality.
Identifiers: *Amchitka Island (Alaska), Gross alpha activity, Gross beta activity.

Water samples were collected from Amchitka Island, Alaska, during October 1972. Tritium determinations were made on all samples collected and gross alpha and gross beta/gamma determinations were made on 41 samples. The gross alpha and gross beta determinations when compared with previously determined ranges for freshwaters on Amchitka Island show no trends. The gross alpha activity, as U equivalent, ranged from less than 0.3 to 1.7 pCi/liter (picocuries per liter) for the October 1972 sampling; one value was less than 2.7 pCi/liter. This compares with a range from less than 0.1 to 23 pCi/liter in freshwaters on Amchitka observed prior to detonation of Cannikin as reported by Beetem, Washington, Janzer, and Schroder (1971). The gross beta activity in water as Cs-137 equivalent in the October 1972 samples ranged from 1.7 to 14 pCi/liter. This range, compared to the range observed in freshwater samples obtained prior to Cannikin (less than 1.0 to 36 pCi/liter), shows no indication of event-related radioactivity. The only water samples having detectable (greater than 640 pCi/liter) tritium activity were those collected at the Long Shot site. The sample from ST01-52, Weir 1, which represents surface water drainage of the Long Shot site, had a tritium concentration of 790 pCi/liter. (Woodard-USGS)
W73-12945

INVESTIGATION OF THE NATURE, EXTENT AND FATE OF NATURAL OIL SEEPAGE OFF SOUTHERN CALIFORNIA,
California Univ., Santa Barbara.
P. G. Mikolaj, A. A. Allen, and R. S. Schlueter.
Available from NTIS, Springfield, Va. 22151 as COM-73-10447 - Price $3.00 printed copy; $1.45 microfiche. Preprint of Paper OTC 1549, presented at 4th Annual Offshore Technology Conference, Houston, Texas, May 1-3, 1972. 16 p, 6 fig, 1 tab, 19 ref. NSF Grants GH-43 and GH-95, NOAA SG USDC 2-35208-5.

Descriptors: *Water pollution sources, *Oil, *Coasts, *Bays, *California, Seepage, Geomorphology, Surveys, Oily water, Data collections, Evaluation.
Identifiers: *Natural oil seepage, Oil slicks.

Natural oil and gas seeps in the Santa Barbara Channel and in Santa Monica Bay have been investigated using aerial, surface, and underwater survey techniques. These studies have provided an insight to the nature and extent of natural submarine seepage and have resulted in the development of procedures and equipment for investigating oily material in the marine environment. Ten separate zones of offshore seepage have been investigated and extensive bottom surveys at some of these sites have revealed ocean floor conditions, modes of oil release, and seepage flow rates. Oil is released from these seeps at a total rate approaching 100 barrels per day, and the resulting oil slicks contaminate several square miles of surface water. Standardized methods have been developed for sampling, classifying, and characterizing oil-tar beach pollutants; these techniques have been field tested and have provided baseline pollution levels along several miles of coastline. (Woodard-USGS)
W73-12958

TRACE METAL BASELINE STUDIES ON THE MURDERKILL AND ST JONES RIVERS, DELAWARE COASTAL PLAIN,
Delaware Univ., Newark. Dept. of Geology.
F. Bopp, III, F. K. Lepple, and R. B. Biggs.
Available from NTIS, Springfield, Va. 22151 as COM-73-10580 - Price $3.00 printed copy; $1.45 microfiche. Delaware University College of Marine Studies Report DEL-SG-10-72, December 1972. 31 p, 11 fig, 3 tab, 5 ref.

Descriptors: *Baseline studies, *Water quality, *Trace elements, *Rivers, *Delaware, Construction, Sewage treatment, *Bottom sediments, Chemical analysis, Iron, Magnesium, Zinc, Chromium, Copper, Lead, Cadmium, Mercury, Nickel, Strontium, Correlation analysis, Water pollution sources.
Identifiers: *Murderkill River (Del), *St. Jones River (Del).

Concentrations of trace metals are tabulated for bottom sediment samples collected from the Murderkill and St. Jones Rivers in Delaware. The principal purpose is to establish a trace metal baseline for the Murderkill River prior to commencement of operation of the Kent County Regional Sewage Treatment Plant, presently under construction near Frederica, Delaware. Baselines will be established for iron, magnesium, zinc, chromium, copper, lead, cadmium, mercury, nickel and strontium. In addition to the establishment of these baselines, the second purpose is to contrast the Murderkill River baseline with a similarly established baseline for the St. Jones River, which has been the recipient of domestic sewage and industrial and other wastes for a number of years. By comparing the results of these two river systems' baselines, it is hoped that some projection may be made of those metals which should be reasonably closely monitored after commencement of operation of the sewage treatment facility. (Woodard-USGS)
W73-12959

A SYMPOSIUM ON THE PRESERVATION AND MULTIPLE-USE PROBLEMS IN THE GREAT LAKES,
Department of Fisheries and Forestry, Ottawa (Ontario).
For primary bibliographic entry see Field 05C.
W73-12962

EFFECT OF ENVIRONMENTAL FACTORS ON WATER UTILIZATION AND BORON ACCUMULATION AND TRANSLOCATION IN SUGARCANE,
Hawaii Agricultural Experiment Station, Honolulu.
For primary bibliographic entry see Field 03F.
W73-12966

NITROGEN LOSS FROM FLOODED SOIL,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W73-12967

MERCURY IN CANADIAN FISH,
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
For primary bibliographic entry see Field 05C.
W73-12970

EFFECT OF TIME, WATER FLOW AND PH ON CENTRIPETAL PASSAGE OF RADIOPHOSPHORUS ACROSS ROOTS OF INTACT PLANTS,
Connecticut Univ., Storrs. Dept. of Plant Science.
F. H. Emmert.
Plant Physiol. Vol 50, No 3, p 332-335, 1972. Illus.
Identifiers: *Bean roots, Centripetal passage, Humidity, Phaseolus-vulgaris, Phosphorus, Hydrogen ion concentration, *Radiophosphorus.

The effects of time, rate of the water flow and ambient pH on centripetal passage of radiophosphorus across intact bean (Phaseolus vulgaris) roots to the xylem were studied. Isotope which completed passage and entered the xylem stream, as well as amounts delivered to the plant top, served to measure centripetal passage. Centripetal passage of radiophosphorus increased parabolically reaching a maximum after 1 hr and maintained this level during the second hr. This pattern was consistent for all conditions studied. The curve suggested that passage did not progress as an abrupt front, but rather that it occurred through a phosphorus pool before reaching the xylem. Differences in rate of water flow through test plants, accomplished by adjusting the humidity of the foliage environment, did not significantly affect centripetal passage of radiophosphorus. Water flow did, however, profoundly influence composition of the xylem stream by altering the solvent to isotope ratio. Centripetal passage of radiophosphorus was not affected by solution pH in the acid range (pH 4.8, 5.2, 6.4), but was inhibited in the more alkaline range (pH 7.0, 7.5, 8.0). The similarity of these findings to those in the literature for phosphorus uptake by individual cells suggests that cell uptake may constitute the primary rate-limiting step in the over-all process of ion passage to the xylem.—Copyright 1973, Biological Abstracts, Inc.
W73-12991

ON THE WATER POLLUTION IN THE AREA OF URBAN DEVELOPMENT (IN JAPANESE),
Kobe Univ. (Japan). Faculty of Agriculture.
S. Coto, and N. Hatazawa.
Sci Rep Fac Agric Kobe Univ. Vol 10, No 1, p 97-101, 1971. Illus. English summary.
Identifiers: Bacteria, Fish, Pollution, *Urban development, *Water pollution, *Japan, Chlorides, Sulfides.

The amount of Cl' increases in accordance with the increase of the population density. Cl' contents of 3 rivers near Akashi City are practically equal, and also the concentration of Cl' has a tendency to be in proportion to that of SO4'. Biological O2 demand is high in the water of the Hazetani, lower in the Akashi, and highest in the Igawa. The pollution of the Hazetani has its origin in the waste from the livestock industry and that of the Igawa is caused by waste from factories. The numerical value of bacterium/ml in the water of the Igawa is the highest and is the least in the Akashi. While farmers use wells for the most part, it was found that the majority of well water is not fit to drink. The Osaka Group has several marine clay layers and in case of Shempoku New Town these layers were exposed to the air by the earthwork. The runoff water over the surface was contaminated with the marine clay (pH 2.71) and fishes in the reservoir died from the inflow water. The amount of SO4' was 110 ppm and the pH of the water was 4.2.—Copyright 1973, Biological Abstracts, Inc.
W73-12996

INFLUENCE OF WATER POTENTIAL ON GROWTH, ANTIBIOTIC PRODUCTION AND SURVIVAL OF CEPHALOSPORIUM GRAMINEUM,
Washington State Univ., Pullman. Dept. of Plant Pathology.
G. W. Bruehl, B. Cunfer, and M. Tiovainen.
Can J Plant Sci. Vol 52, No 4, p 417-423, 1972. Illus.
Identifiers: Antibiotic production, *Cephalosporium-gramineum, Growth, Survival, Wheat straw, *Fungus.

C. gramineum grew on agar media at osmotic water potentials from -1.3 bars to between -98 and -112 bars. The growth of antibiotic -producing (+) and nonproducing (-) isolates was affected equally by water potential. Antibiotic production was detected by bioassay over the entire range of significant growth (to about -83 to -98 bars). Production of antibiotic relative to the growth rate of C. gramineum was least when the fungus grew fastest and most when the fungus was under moderate water stress (between -27 and -55 bars). When (wheat) straws infested with C. gramineum were incubated on soil at 15C at various water potentials, + isolates had the least advantage over - isolates on water saturated soil (near 0 bar) and at the driest condition tested (-258 bars). In contrast, antibiotic-producing isolates had the greatest survival advantage between -10 and -67 bars, which corresponds to the range of water potentials within which antibiotic production was greatest relative to mycelial growth. The vigor of C. gramineum in straw on water-saturated soil indicates coexistence with bacteria; its performance between about -10 and -137 bars indicates that relatively xerophytic soil fungi are its most severe antagonists in nature.—Copyright 1973, Biological Abstracts, Inc.
W73-12999

5C. Effects of Pollution

ASPECTS OF THE BIOGEOCHEMISTRY OF CARBOHYDRATES AND PROTEINS IN AQUATIC ENVIRONMENTS,
Woods Hole Oceanographic Institution, Mass.
K. Mopper, and E. T. Degens.
Available from the National Technical Information Service as PB-212 685, $3.00 in paper copy, $1.45 in microfiche. Technical Report WHOI-72-68, September 1972. 249 p, 34 fig, 6 tab, 107 ref, 4 append.

Descriptors: *Geochemistry, *Biochemistry, *Carbohydrates, *Proteins, *Cycling nutrients, *Sediments, *Organic matter, Bottom sediments, Aquatic environments, Diagenesis, Degradation (Decomposition), Metals, Ions, Organic compounds, Paleolimnology, Amino acids, Organic wastes, Analysis, Diatoms, Coral, Plankton, Carbon, Nitrogen, Technology, Chromatography, Climatic zones, Analytical techniques, Sedimentology, Oceans.
Identifiers: Red Sea, Black Sea, Lake Tanganyika (Africa), Lake Kivu (Africa), Arabian Sea, Gay Head (Bermuda), Cariaco Trench (Venezuela), Walvis Bay (S. Afr.), Argentine Basin, Oyster Pond (Woods Hole, Mass.), Winthrop (Mass.), Cranston (Rhode Island), Foraminifera, Vertebrates, Iceland, New York Bight, Mineralized tissues, Sugar analysis.

Factors affecting organic matter cycling, factors determining quantity and quality of organic matter incorporated into sediment, effect on composition and structure of organic input at sediment-water interface, diagenetic factors affecting sediment organic matter, organic matter condition during diagenesis, and possible fossil organic matter use to elucidate paleo-environments are considered. In shallow regions of the ocean, input is predominated by tripton; in deep regions input is predominated by aged, refractory material with composition reflecting a composite of highly degraded tripton and particulate organic matter formed from dissolved organic matter. Biological degradation is limited to the upper 10-20 cm of sediment. At 20 cm below the sediment-water interface further diagenesis occurs more slowly and is controlled by processes such as organic-organic condensation, organic-metal ion complexation, organic-mineral interaction, and increasing temperature. The degree of metal complexation or carbohydrates is indicative of the Eh at the sediment-water interface. Amino acids become increasingly metal-complexed with time, hence, the degree of complexation of amino acids may not be as useful as that of sugars for determining paleo-acidizing and paleo-reducing conditions. Glucose content of sediment may give estimates of terrigenous input. A high amino acid to hexosamine ratio reflects high productivity, perhaps eutrophication. (Jones-Wisconsin)
W73-12371

ENERGETICS OF NATURAL POPULATIONS OF FRESHWATER MACROCONSUMERS,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
K. W. Cummins.
Available from the National Technical Information Service as TD-COO-2002-20, $3.00 in paper copy, $1.45 in microfiche. Progress Report 1971-1972. 52 p, 8 fig, 11 ref, append. AEC AT (11-1)2002.

Descriptors: *Degradation (Decomposition), *Aquatic populations, *Energy budget, *Detritus, Model studies, Streams, Leaves, Periphyton, *Michigan, Respiration, Predation, Grazing, Data collections, Digestion, Microorganisms, Data storage and retrieval, Data processing, Growth rate, Metabolism, Herbivores, Computer programs, Foods, Analytical techniques.
Identifiers: *Detrivores, *Macroconsumers, Leaf litter.

Energy budgets for key component macroconsumer species were delineated within the framework of a generalized model of stream ecosystem function. Emphasis was on natural field populations and the interrelation of data at the population level to the overall structure and function of woodland stream ecosystems. Species associated with leaf litter processing were studied: large species ('shredders') involved in fragmentation of microbially infested litter, and smaller species ('collectors') feeding on resultant fine detrital particles. Given existing data of temperate zone streams, the general pattern in undisturbed systems is a dependence upon the input of reduced carbon compounds of terrestrial origin and, therefore, the dominance of heterotrophic processing. Besides a general statement covering the overall aspects of leaf litter, predictions will be possible concerning relative roles of microbial populations, shredders and collectors, in the processing of large particle detritus. Consumption indices for representative species in relation to age, density, food quality and quantity, temperature and species interactions were determined. Tracer studies were employed for additional independent estimates of consumption index values in the case of shredders and for collectors and grazers when it is difficult to make gravimetric assessments of food supply. (Jones-Wisconsin)
W73-12374

PREIMPOUNDMENT STUDY OF WEST POINT LAKE, GEORGIA,
Environmental Protection Agency, Athens, Ga. Southeast Water Lab.
R. F. Schneider, D. W. Hill, M. R. Weldon, and R. E. Gentry.
Available from the National Technical Service as PB-213 306, $3.00 in paper copy, $1.45 in microfiche. Technical Study TS 03-71-208-001.2, January 1972. 201 p, 30 fig, 12 tab, 21 ref, 10 append.

Descriptors: *Pre-impoundment, *Georgia, *Reservoirs, Physical properties, Chemical analysis, Biological properties, Bacteria, Benthos, Temperature, Color, Turbidity, Hydrogen ion concentration, Conductivity, Suspended solids, Dissolved solids, Dissolved oxygen, Biochemical oxygen demand, Alkalinity, Chlorides, Nitrogen, Phosphorus, Organic matter, Iron, Manganese, Phytoplankton, Periphyton, Invertebrates, Coliforms, Salmonella.
Identifiers: *West Point Lake (Ga.), Chattahoochee River (Ga.).

The proposed West Point Lake, Georgia, is designed to provide hydroelectric power, flood control, navigation, water supply and recreation. The potential for accelerated eutrophication and its associated nuisance problems are increased greatly by both past and current municipal and industrial development in the watershed. Thermal stratification is expected to occur following impoundment. Associated hypolimnetic problems of low dissolved oxygen, sulfide odors, and high levels of dissolved iron and manganese may also occur unless corrective measures are taken. Isolated Salmonella serotypes indicate several areas would be hazardous for recreation at present. Fecal coliform densities violate recreational water quality criteria at many stations. After closure of the dam, the increased residence time in the lake will tend to dampen water quality variations now present in the free-flowing streams and partially reduce bacterial densities and water turbidity from preimpoundment levels to levels acceptable for a variety of water uses. Following completion of secondary biological treatment and chlorination at a wastewater treatment plant, water quality should improve. Secondary treatment and disinfection by that time will also be provided by most other wastewater treatment plants involved. Combined sewer discharges during rains will probably cause problems for many years. (Jones-Wisconsin)
W73-12376

NUTRIENT ENRICHMENT AND EUTROPHICATION OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
C. L. Schelske.
Available from the National Technical Information Service as COO-2003-17, $3.00 in paper copy, $1.45 in microfiche. Progress Report, July 1972. 25 p, 2 fig, 1 tab, 27 ref. AEC At (11-1)-2003.

Descriptors: *Eutrophication, *Lake Michigan, *Nitrogen, *Phosphorus, *Silica, Great Lakes, Phytoplankton, Productivity, Carbon, Ammonia, Chemical analysis, Cyanophyta, Diatoms, Model studies, Nutrients, Analytical techniques, Limiting factors, On-site tests, Laboratory tests, Water pollution effects, Trace metals, Vitamins.

A program has developed and focuses on phytoplankton, phytoplankton productivity, major plant nutrients, the distribution and interrelationship of these parameters, and causative mechanisms associated with accelerated eutrophication of the upper Great Lakes, particularly Lake Michigan. A general model that can be used to predict and assess the state and rate of eutrophication in the three upper Great Lakes was formulated. Of the major plant nutrients, phosphorus is the limiting nutrient; thus phosphorus inputs and supplied control eutrophication rate. In large lakes, such as the Great Lakes, which have long renewal times, net utilization of silica and nitrogen is an excellent means of assessing the extent and rate of eutrophication. Silica utilization is a good measure of the eutrophication rate in these lakes because phytoplankton assemblages are composed mainly of diatoms. Another valid measure is net nitrate nitrogen utilization until nitrogen is depleted or until significant nitrogen fixation occurs. Both limiting conditions seem to occur more or less simultaneously. Since phosphorus is the major limiting nutrient, rate of eutrophication should be predictable from concentrations of paticulate or total phosphorus. (Jones-Wisconsin)
W73-12377

GAS PRODUCTION IN SEDIMENTS OF LAKE MENDOTA, WISCONSIN,
Wisconsin Univ., Madison. Dept. of Soil Science.
R. L. Chen, D. R. Keeney, J. G. Konrad, A. J. Holding, and D. A. Graetz.
J Environ Qual. Vol 1, No 2, p 155-158. 1972.
Identifiers: *Gas production, Sediments, Wisconsin (Lake Mendota), *Lake sediments, Lakes.

Nitrate added to Lake Mendota sediment samples incubated under anoxic conditions disappeared rapidly. When 15NO3 was added, 15N2 appeared in the atmosphere within 24 hr. Gas collected from sediments in situ contained from 24 to 50% N2 and from 45 to 75% CH4. Sediment samples from 3 sites in the lake varying in depth of water column were incubated under He in the laboratory. Production of N2 and CH4 increased with time at a low (2 ppm) level of NO3-N addition, but CH4 production was inhibited for at least 27 days by addition of 100 to 1000 ppm NO3-N. Production of N2 was less at 1000 than at 500 ppm NO3-N added, probably due to suppression of the nitric oxide reductase enzyme system. Evidence was obtained that the denitrification pathway in lake sediments is the same as that reported for submerged soils.—Copyright 1972, Biological Abstracts, Inc.
W73-12378

THE INFLUENCE OF VEGETATION ON THE REDOX PROFILE IN THE SEDIMENT OF GRANE LANGSO, A DANISH LOBELIA LAKE,
Copenhagen Univ., Hillerod (Denmark). Freshwater-Biological Lab.
S. Wium-Andersen, and J. M. Andersen.
Limnology and Oceanography, Vol 17, No 6, p 948-952, 1972. 3 fig, 1 tab, 11 ref.

Descriptors: *Vegetation, *Oxidation-reduction potential, *Sediments, Lakes, Rooted aquatic plants, Oxygen, Photosynthesis, Iron compounds, Sands, Mud, Rhizosphere.
Identifiers: *Grane Langso (Denmark), *Lobelia, Littorella, Isoetes, Kalgaard So (Denmark), Isoetides, *Denmark.

The sediment redox profiles in Danish lakes supporting rooted plants is substantially changed by the vegetation. To a water depth of 4 m, sediment in Grane Langso consists of sand, and, at greater depths, of mud. Rooted vegetation occurs to a depth of 4-5 m, the most important plants being the isoetides: Littorella uniflora, Lobelia dortmanna, and Isoetes lacustris. The redox potentials and the pH were measured on two cores from each depth. Measurements of Eh in the sediment have shown the upper 20 cm of sediment is oxidized down to a 4 m depth. The constant Eh values can be explained by relative constant biomass of the isoetides throughout the year. In the laboratory Lobelia was manipulated to photosynthesize in the aquarium under simulated natural conditions. Oxygen liberation was 3-5 times greater by the roots than by the leaves, agreeing with the fact that root surface of Lobelia is 3-5 times larger than the leaf surface. It is concluded that the plants work as oxygen pumps. Presence of an oxidized rhizosphere depends on the presence of isoetides. If eutrophication causes their disappearance, the oxidized rhizosphere also disappears. (See also W73-12378) (Jones-Wisconsin)
W73-12379

FISH VIRUSES: HISTOPATHOLOGIC CHANGES ASSOCIATED WITH EXPERIMENTAL CHANNEL CATFISH VIRUS DISEASE,
Bureau of Sport Fisheries and Wildlife, Kearneysville, W. Va. Eastern Fish Disease Lab.
K. Wolf, R. L. Herman, and C. P. Carlson.
J Fish Res Board Can. Vol 29, No 2, p 149-150. 1972. Illus.

Identifiers: *Channel catfish, *Fish diseases, Histopathologic change (Fish), Viruses, *Catfish virus.

A histologic examination was carried out on fry with experimentally induced channel catfish virus disease (CCVD). The infection produced a hemorrhagic and necrotic disease with the target organs being the kidneys, liver, digestive tract and skeletal muscle. The results agree with symptoms of the disease and with published data on quantifications of virus in specific organs.—Copyright 1972, Biological Abstracts, Inc.
W73-12382

SOME EFFECTS OF ARTIFICIAL FERTILIZATION ON ENCLOSED PLANKTON POPULATIONS IN MARION LAKE, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Inst. of Animal Resource Ecology.
M. Dickman, and I. E. Efford.
Journal Fisheries Research Board of Canada, Vol 29, No 11, p 1595-1604, 1972. 6 fig, 1 tab, 24 ref.

Descriptors: *Plant populations, *Fertilizations, *Plankton, *Succession, *Canada, Nutrients, Seasonal, Primary productivity, Nitrates, Phosphates, Standing crops, Cyanophyta, Chlorophyta, Chrysophyta, Euglenophyta, Chlamydomonas, Eutrophication, Algae.
Identifiers: *Marion Lake (British Columbia), Cryptophyta.

Initial effects of fertilization on species composition and bloom formation, whether or not a predictable pattern occurs following lake fertilization and how such a pattern is influenced by seasonal differences were studied. Three different nutrient regimes were used in four plywood enclosures at two stations in Marion Lake, B.C., to determine whether the pattern is dependent on type of fertilization. After a single application of nutrients in the fall, summer, and spring, primary productivity increased within a 2-week period whether nitrate, phosphate, or a combination of the two was used. The species responding to the three nutrients generally differed both within and between seasons. In all seasons, there was a decrease in total plankton diversity (based on productivity) accompanied by an increase in relative productivity of a few phytoplankton species. Phosphate was most stimulatory during fall. During spring, N + P was most stimulatory and nitrate next. In summer, N + P was again most stimulatory. Of the species that increased in density, 78% were not detectable at time of fertilization. A rapid increase in density of rare species culminated in a bloom 2-3 weeks after fertilization. (Jones-Wisconsin)
W73-12384

STRATIGRAPHY OF FOSSIL PIGMENTS AS A GUIDE TO THE POSTGLACIAL HISTORY OF KIRCHNER MARSH, MINNESOTA,
Ohio Wesleyan Univ., Delaware. Dept. of Botany and Bacteriology.
J. E. Sanger, and E. Gorham.
Limnology and Oceanography, Vol 17, No 6, p 840-854. 12 fig, 31 ref.

Descriptors: *Analytical techniques, *Marshes, *Geologic history, *Aquatic productivity, Sediment, Stratigraphy, Pigments, *Minnesota, Allogenic succession, Organic matter, Sedimentation rates, Paleolimnology.
Identifiers: *Fossil pigments, *Postglacial, *Kirchner Marsh (Minn.).

Whether data on fossil pigments would substantiate conclusions previously drawn from pollen and macrofossil studies about ecological and limnological changes that occurred during postglacial time was tested in Kirchner Marsh, Minnesota. Successional developments in postglacial ecology and limnology, revealed by concentration and diversity of sedimentary plant pigments, include a

peak of aquatic production reached during the early postglacial warm, humid interval about 10,000 B.P. Production levels then declined. Very low levels of aquatic production are indicated by about 6,000 B.P. in the middle part of a warm, dry interval which was followed by low pigment concentrations (except for a brief interval about 5,000 B.P.) but with a marked rise in the ratio of chlorophyll derivatives to carotenoids, indicating an increase in allochthonous organic input accompanying the return of cooler moister conditions. The result was encroachment of oak forest on the prairie, followed by succession to reed-swamp on the lake. Pigment data are generally in harmony with the ecological conclusions from pollen and macrofossils, but they provide much more information on changes in aquatic productivity at the site. This studyprovides further strong evidence that stratigraphic analysis of sedimentary pigments can be of fundamental value in paleolimnology. (Jones-Wisconsin)
W73-12386

CORRELATED LIGHT AND ELECTRON MICROSCOPE STUDIES ON BROWN ALGAE. II. PHYSODE PRODUCTION IN DICTYOTA,
Leeds Univ. (England). Dept. of Plant Sciences.
L. V. Evans, and M. S. Holligan.
New Phytologist, Vol 71, No 6, p 1173-1180, 1972. 5 plates, 44 ref.

Descriptors: *Microscopy, *Cytological studies, *Phaeophyta, Electron microscopy, Marine algae, Plant morphology, Biochemistry.
Identifiers: *Physodes, *Dictoyota, *Trearddur Bay (North Wales).

The chemical nature and other attributes of large irregularly shaped bodies of varying electron-opacity, present within chloroplasts of thallus and reproductive cells of Dictoyota dichotoma, were explored. These bodies, apparently extruding into the cell cytoplasm, differ from the more conventional small, intensely osmiophilic chloroplast inclusions and appeared more abundant at some seasons that at others. Whether on their release into the cell cytoplasm the extruded products correspond to any of the large number of components described earlier as occurring in Dictyota cells was also explored. The physodes of fucosan vesicles in vegetative and reproductive cells originate in the plastids. Precursor material expelled from the chloroplast matrix, may run together to produce large physodes in cell cytoplasm. Staining reactions indicate the physodes are phenolic or tannin-like, perhaps photosynthetic products. Physodes in thallis apical region are exceedingly resistant and stable compared with those in older parts of thalli. In addition to the possible occurrence of several different kinds of physodes, a 'chemical evolution' of fucosan may occur according to season or in different parts of the thallus, a theory supported by differential reaction to osmium tetroxide by the larger, older physodes compared with the apical physodes. (Jones-Wisconsin)
W73-12388

STUDIES ON THE GROWTH OF PHAEODACTYLUM TRICORNUTUM. II. THE EFFECT OF ORGANIC SUBSTANCES ON GROWTH,
University Coll. of Swansea (Wales). Dept. of Botany.
J. Hayward.
Physiologia Plantarum, Vol 21, p 100-108, 1968. 3 fig, 3 tab, 29 ref.

Descriptors: *Plant growth, *Diatoms, *Organic compounds, Light, Phototropism, Carbon, Cultures.
Identifiers: *Phaeodactylum tricornutum, Heterotrophy.

Ability to grow heterotrophically appears in a number of genera and species through the major algal taxonomic divisions. There are indications of extremely limited heterotrophic ability among the Bacillariophyta and an apparent widespread occurence of obligate phototrophy. The possibility of heterotrophic nutrition of Phaeodactyllum tricornutum was studied by testing effects of a range of organic compounds upon its growth in the light. Results of experiments of 21 days duration at 18C under non-aerated conditions are expressed as percentage of growth in the basic mineral medium which is equated to 100. From the results obtained in the light a number of compounds were selected for testing as heterotrophic substances in the dark to determine any effect upon growth. No substance tested was capable of supporting growth of the diatom in the dark and it appears that the organism is obligately phototrophic. P. tricornutum is able to respire glucose, mannitol and lactate without the energy released being apparently available for growth. Some slight growth stimulation occurs in the light which appears to be partly due to occurrence of trace element impurities in the organic compounds. (Jones-Wisconsin)
W73-12389

PROCEEDINGS OF SEMINAR ON EUTROPHICATION AND BIOSTIMULATION.
California State Dept. of Water Resources, Sacramento.

Held at Clear Lake, California, Oct 19-21, 1971. November 1972. 229 p, 66 fig, 21 tab, 300 ref.

Descriptors: *Conferences, *Eutrophication, *Biological communities, Carbon, Inorganic compounds, Nutrients, Nitrogen, Phosphorus, Detergents, *California, Biochemistry, Sediment-water interfaces, Tile drainage, Geochemistry, Oxidation-reduction potential, Light, Temperature, Solar radiation, Photosynthesis, Productivity, Zooplankton, Management, Nutrient removal, Economics, Mathematical models, Phytoplankton, Hydraulic aspects, Bioassay, Algae, Sewage effluents, Growth rates, Waste water treatment, Oil pollution, Diatoms, Polychlorinated biphenyls, DDT, Limiting factors.
Identifiers: *San Francisco Bay-Delta, Algal growth potential.

This seminar was conducted for the purpose of defining, controlling, or limiting eutrophication in lakes and reservoirs. Papers were presented on the following subjects: The effect of inorganic carbon on eutrophication; Nitrogen: Recent studies on the role of nitrogen in the biostimulation and eutrophication of aquatic ecosystems; Phosphorus and eutrophication; Sediment-water nutrient interchange in eutrophic lakes; Effects of light and temperature on algal growth; The role of zooplankton in the process of eutrophication; Nutrient control in north San Francisco Bay; Mathematical modeling of phytoplankton populations; Algal bioassays: Examples, advantages and limitations of current approaches; AGP studies in the San Francisco Bay-Delta; PCBs and DDT. (See W73-12392 thru W73-12402) (Auen-Wisconsin)
W73-12391

THE EFFECT OF INORGANIC CARBON ON EUTROPHICATION,
Utah Water Research Lab., Logan.
Joel C. Goldman.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 3-53. 10 fig, 7 tab, 155 ref.

Descriptors: *Eutrophication, *Carbon, *Limiting factors, Inorganic compounds, Nutrients, Nitrogen, Phosphorus, Carbon cycle, Productivity, Alkalinity, Hydrogen ion concentration, Enzymes, Chemical reactions, Laboratory tests, Carbon dioxide.
Identifiers: *Inorganic carbon, Carbonic anhydrase, Carbon sources.

The role of carbon in controlling algal growth in natural waters, carbon cycling and metabolism, inorganic carbon chemistry, algal utilization of carbon, and concepts of nutrient limitation are discussed and reviewed. Organic carbon compounds may be synthesized from carbon dioxide through three types of reactions--photosynthesis by plants and algae, photosynthesis by certain bacteria, and carbon incorporation by other mechanisms. Extraction of carbon dioxide from an algal growth system through assimilation into algal biomass faster than it can be replaced through atmospheric carbon dioxide diffusion, respiration, fermentation processes, and readjustment of solid carbonate equilibria leads to increased pH. The slowest reaction involved in the chemical transformation of the ionic forms of inorganic carbon to free carbon dioxide could be rate limiting if carbon were limiting in an algal bloom and could be the controlling factor governing utilization of inorganic carbon in photosynthesis. What specific role the enzyme, carbonic anhydrase, has in relation to uptake of inorganic carbon by algae in natural waters still needs clarification. It is concluded that carbon limits productivity only under certain well defined conditions that occur relatively infrequently in nature. (See also W73-12391) (Jones-Wisconsin)
W73-12392

NITROGEN: RECENT STUDIES ON THE ROLE OF NITROGEN IN THE BIOSTIMULATION AND EUTROPHICATION OF AQUATIC ECOSYSTEMS,
Clear Lake Algal Research Unit, Lakeport, Calif.
Alexander J. Horne.
In: Seminar Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 55-70. 3 fig, 2 tab, 38 ref.

Descriptors: *Nitrogen, *Eutrophication, Nitrogen compounds, Nitrogen cycle, Limiting factors, Sea water, Freshwater, Marshes, Lentic environment, Nitrogen fixation, Algae, Productivity, Water pollution sources, Dentrification, Abatement, *California.
Identifiers: Nitrogen sources, *Clear Lake (Calif).

Role of nitrogen in eutrophication and biostimulation, biological methods of introduction of new nitrogen into aquatic ecosystems, and the essential conservatism of these systems is discussed in the light of recent work. It should be noted that the two major changes in physical state of nitrogen, denitrification and nitrogen fixation, occur in anoxic conditions or at least conditions of low dissolved oxygen. In almost all circumstances N-limitation, if it occurs, will be a temporary phenomenon subject to variations. N-limitation, seems to be found in marine, freshwater and marshy areas; examples are given. Areas shown to be N-limited are highly mixed or upwelling areas of open and coastal oceans, estuaries, and some freshwater lakes. The importance in eutrophication control of reducing N-inflow before it reaches the lake or sea is demonstrated. The approximate amount of accelerated eutrophication from a known N-input could be predicted because N forms an essential and reasonably constant percentage of body weight. The real effect on accelerated eutrophication depends on basin morphology. Contributions of nitrogen fixation to some lake budgets over the world are listed. (See also W73-12391) (Jones-Wisconsin)
W73-12393

PHOSPHORUS AND EUTROPHICATION,
California State Dept. of Water Resources, Sacramento.
Randall L. Brown, Donald B. Porcella, and Daan Toerien.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 71-81. 4 fig, 10 ref.

Descriptors: *Phosphorus, *Eurtophication, *Limiting factors, Detergents, Waste water (Pollution), Algae, Metabolism, Biochemistry, Phosphates, Scenedesmus, Phosphorus compounds, Nutrients, Nitrogen, *California, Growth rates, Nutrient removal, Tile drainage, Productivity.
Identifiers: San Joaquin Valley (Calif.), Firebaugh (Calif.), San Francisco Bay-Delta (Calif.), Phosphorus removal.

The relationship between phosphorus and algae is summarized in an attempt to provide some clarification of the role of phosphorus in algal metabolism. Phosphorus must be in orthophosphate form to enter into biochemical reactions within the cell; thus despite the publicity of P-containing detergents, they contain only the polyphosphate form which is not readily assimilated by algae. The exact role of phosphorus in algal metabolism is complicated by the changes in solubility of phosphorus compounds during algal growth stages and is also based on growth kinetics. The majority opinion is that, apparently, silicon may become limiting in the San Francisco Bay-Delta and algal populations may shift from predominantly diatoms to green algae. Lakes and reservoirs may act as their own phosphorus source when P entering the body of water is deposited on the bottom either as organic P bound in the algae or inorganic sediments and phosphorus precipitates. Phosphorus removal from influent water by alum or lime precipitation can be effective and economical in removing more than 95% of phosphorus in sewage; in situ reduction is accomplished by adding alum. Whether this waste treatment can be rationally defended in terms of the amount of environmental enhancement obtained per dollar expended is debatable. (See also W73-12391) (Jones-Wisconsin)
W73-12394

SEDIMENT-WATER NUTRIENT INTERCHANGE IN EUTROPHIC LAKES,
Utah Water Research Lab., Logan.
Donald B. Porcella, Kirk L. Schmalz, and William A. Luce.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, Caliornia, p 83-109. 1 fig, 5 tab, 23 ref.

Descriptors: *Sediment-water interfaces, *Nutrients, *Eutrophication, Algae, Biochemistry, Geochemistry, Cycling nutrients, Sorption, Chemical precipitation, Oxidation-reduction potential, Bottom sediments, Mixing, Distribution, Absorption, Productivity, Phosphorus, *Utah.
Identifiers: *Hyrum Reservoir (Utah).

Sediment role in controlling nutrient availability in eutrophic lakes is predicated on algal bloom relationship to sediment nutrients; the sediment nutrient materials available are nutrients reduced in overlying waters and their amount depends on duration of the bloom after restriction of nutrient input. Overall process involves physical sorption, chemical precipitation, and biological nutrient uptake from solution; then particulate inorganic and organic material is transferred to the bottom by settling or biological mechanisms. Chemical changes in sediments brought about primarily by microbial decomposition of organic matter result in organic matter mineralization as well as anaerobic conditions, which change the oxidation-reduction potential. In both eutrophic and oligotrophic lakes, sediments tend to accumulate more nutrients than they contribute to overlying water. Estimation of nutrient cycling through various release mechanisms indicates that considerable release does occur and an algal bloom could possibly be sustained by sediment-derived nutrients. Although phosphorus release may sustain an algal bloom, the rate is insufficient, under natural conditions, to maintain high algal concentrations when influent phosphorus is lowered. It seems feasible to determine release and accumulation rates and to develop descriptive models (including the different nutrients and their compartments) in order to evaluate the practical significance of sediment nutrient sink to algal productivity. (See also W73-12391) (Jones-Wisconsin)
W73-12395

EFFECTS OF LIGHT AND TEMPERATURE ON ALGAL GROWTH,
California State Dept. of Water Resources, Sacramento.
Randall L. Brown.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 111-131. 12 fig, 1 tab, 17 ref.

Descriptors: *Light, *Temperature, *Algae, *Plant growth, Solar radiation, Photosynthesis, Eutrophication, Light intensity, Pigments, Chlorophyll, Light penetration, Energy conversion, Metabolism, Nitrogen, Limiting factors, *California, Productivity.
Identifiers: San Joaquin Delta (Calif), Lake Tahoe (Calif-Nev).

In consideration of eutrophication and biostimulation, light availability to algal cells at a certain depth is determined by several factors and can be described by a modification of the Beer-Lambert law. Plant cells capture light energy by use of photosynthetic pigments, including chlorophylls, carotenes, xanthophylls, and phycobilins. Two pigments, chlorophyll-a and beta carotene, are found in the four major algal groups. Light effect on algal metabolism has been studied using both laboratory and field assays. General shape of the algal response to different light levels is illustrated. If algae develop under stable illumination, cells can become adapted to either high or low light. Algae can exhibit either positive or negative phototaxis. Algal responses directly affected by temperature include metabolism, reproduction, and distribution. Effect of temperature on light saturation intensity of a mixed population of Scenedesmus and Chlorella is illustrated. Of the two factors, light and temperature, light probably has a more direct effect, although temperature has an important indirect effect. The practical implications of the role of light in growth and metabolism appears when placing the blue-green algae in a light environment unfavorable for their growth. Other algae may then dominate. (See also W73-12391) (Jones-Wisconsin)
W73-12396

THE ROLE OF ZOOPLANKTON IN THE PROCESS OF EUTROPHICATION,
California Univ., Davis., Div. of Environmental Studies.
Peter J. Richerson.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 133-140. 1 fig, 1 tab, 10 ref.

Descriptors: *Water quality control, *Zooplankton, *Eutrophication, *Grazing, Algae, Phytoplankton, Crustaceans, Copepods, Rotifers, Cyanophyta, Productivity, California, Nevada, Daphina, Bacteria, Detritus, Management, Fish.
Identifiers: Kellicottia, Asplanchna, Diaptomus oregonesis, Keratella, Polyarthra, Lake Tahoe (Cal.-Nev.), Bosmina, Moina, Lake Erken (Sweden), Clear Lake (Calif.).

The process of zooplankton grazing and its impact upon algal populations as a possible management technique to alleviate eutrophication problems is examined. Grazing rates are expressed as clearing volumes--volume of water filtered (cleaned) of algae or other particles of a defined type per unit time--and are measured for common representatives of important freshwater zooplankton. Zooplankton often exhibit considerable selectivity in their grazing and there are usually pronounced difference in feeding efficiency depending upon the size of the algae. Many blue-green algae are not grazed at all, perhaps contributing to the obnoxious blooms. Phytoplankton biomass seems to cause an increase in zooplankton, which then graze the phytoplankton intensely, reducing phytoplankton biomass, although other hypotheses could be operative. It appears from the estimations presented that grazing is more likely to be a dominant term in the biomass equation in eutrophic than oligotrophic lakes. Zooplankton grazers may derive a significant proportion of their nutrition from sources other than algae, perhaps detritus and bacteria. Several schemes are conceivable in considering zooplankton as populations whose manipulation might contribute to control of algal blooms. Although management of zooplankton for control of eutrophication symptoms is not impossible, no proven techniques exist at present. (See also W73-12391) (Jones-Wisconsin)
W73-12397

NUTRIENT CONTROL IN NORTH SAN FRANCISCO BAY,
Brown and Caldwell, Inc., San Francisco, Calif.
Richard C. Bain, Jr., and Lyle N. Hoag.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 141-162. 9 fig, 29 ref.

Descriptors: *Productivity, *Nutrient removal, *Control, *California, Water quality control, Management, Nitrogen, Phosphorus, Seasonal, Eutrophication, Carbon, Waste water treatment, Algae, Limiting factors, Silica, Diatoms, Standards, Water pollution control.
Identifiers: North San Francisco Bay (Calif.), Antioch (Calif.), Suisun Bay (Calif.), Nitrogen removal.

The San Francisco Bay-Delta area is being studied for a water quality management plan. The present water quality, the rationale for nutrient control, monitoring, source control, treatment processes, and need for nutrient removal are considered. Evaluation of total nutrient content includes nutrient content of algal cells as well as remaining inorganic nutrients in the water mass. Measurement of nutrient forms and density of algal crops provide needed data to help interpret biostimulatory effects. Importance of various nutrients for a particular area can best be determined through evaluation of seasonal spatial nutrient dynamic in the water, algal bioassays with various nutrient inocula and consideration of effluent and receiving water quality relative to chemical composition of algal cells. Phosphorus controls are needed to insure against nutrient imbalance which may cause undesired shifts in dominance of algal forms particularly in view of possible increased clarity and decreased dissolved silica resulting from reduced Delta outflow. Although little economic pressure on dischargers has been applied, as more sewerage agencies are required to remove nutrients, ordinances and industrial service charges will reflect the resulting costs, giving an economic incentive to nutrient source control. Various nutrient removal processes are currently available to wastewater treatment designers. (See also W73-12391) (Jones-Wisconsin)
W73-12398

MATHEMATICAL MODELING OF PHYTOPLANKTON POPULATIONS,
Hydroscience, Inc., Westwood, N.J.
Austin W. Nelson.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 163-172. 5 fig.

Descriptors: *Water quality control, *Mathematical models, *Phytoplankton, Management, Water quality, Growth rates, Physical properties, Estua-

ries, Hydraulic aspects, Temperature, Respiration, Solar radiation, Photosynthesis, Zooplankton, Nutrients, Deltas, Grazing, Light intensity, Mortality, *California, Forecasting.
Identifiers: Antioch (Calif.), *Suisun Bay (Calif.).

Because of nonlinearity of interrelationships among variables governing phytoplankton growth, growth rates are not simply determined. A mathematical model considering combined, changing effects of variables determining growth rates was developed. The factors which combine to determine the abundance of phytoplankton in a body of water include: the physical environment consisting of the hydraulic regimen transporting phytoplankton, water temperature governing rates of growth and respiration, and incident solar radiation providing energy to support photosynthesis; the zooplankton population which, preying upon the phytoplankton, is thus dependent upon the abundance of phytoplankton; the nutrient supply which is regulated by hydraulic transport. Nutrients are depleted as they are consumed by growing phytoplankton, and the supply may be augmented by nutrients contained in local waste discharges. The model has been verified using data collected during 1966 in a portion of the Sacramento-San Joaquin Delta and Suisun Bay. After having been adjusted to reproduce the 1966 data, the model was used to predict phytoplankton populations resulting from an increase in nutrient discharges to the study area. (See also W73-12391) (Jones-Wisconsin)
W73-12399

ALGAL BIOASSAYS: EXAMPLES, ADVANTAGES, AND LIMITATIONS OF CURRENT APPROACHES,
Environmental Protection Agency, San Francisco, Calif. Water Quality Office.
Milton G. Tunzi.
In: Seminar on Eutrophication and Biostimulation, October 1921, 1971, Clear Lake, California, p 173-197. 9 fig, 4 tab, 7 ref.

Descriptors: *Analytical techniques, *Algae, *Bioassay, Photosynthesis, On-site tests, Cultures, Laboratory tests, Testing procedures, Plant growth, Eutrophication, Productivity, Sewage treatment, Agriculture runoff.
Identifiers: Flasks, Static batch cultures, Chemostats.

Algal bioassays to determine the limiting major or minor nutrient for growth, set nutrient levels to avoid algal problems, locate algal bloom caused when several inflows are involved, and determine desirability of probable inflows are evaluated. There are three basic approaches in determining algal cell responses: photosynthetic rate measurements, static flask cell-mass cultures, and chemostat steady-state systems. The photosynthetic approach has been particularly applicable to field in situ assays while the static flask in applicable to laboratory long-term experiments. Recently, chemostats have been proposed as the better approach to algal bioassays because they provide realistic estimates of the algal growth parameters. The applicability of the three methods depends upon the type of data desired, time consideration, economic factors, and the environment under study. Photosynthetic measurements are the best approach to in situ studies. Flasks or static batch cultures give rapid information on algal response to varying concentrations of biostimulants. Chemostat systems are more suitable for long-term studies when time, money, and trained personnel are ample. The kinetic constants evolved can be used to make predictions about yield and algal mass produced by a constant pollution inflow into a receiving water. (See also W73-12391) (Jones-Wisconsin)
W73-12400

AGP STUDIES IN THE SAN FRANCISCO BAY--DELTA,
California State Dept. of Water Resources, Sacramento.
Randall L. Brown.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 199-221. 10 fig, 2 tab, 12 ref.

Descriptors: *Productivity, *Algae, *California, *Bioassay, Monitoring, Nutrients, Waste treatment, Technology, Diatoms, Chlorophyta, Cyanophyta, Nitrogen, Tile drainage, Phosphorus, Chlorophyll, Toxicity, Sewage effluents, Oil pollution, Waste identification, Municipal wastes, Silica, Methodology, Analytical techniques.
Identifiers: *Algal growth potential, San Francisco Bay-Delta (Calif.), San Joaquin River (Calif.), San Pablo Bay (Calif.), Delta-Suisun Bay (Calif.).

A review is presented of the available data accumulated by assays to determine effects of various nutrients on algal growth in the San Francisco Bay-Delta and/or to evalutate the effects of treatment processes on biostimulation. The use of algal growth potential data is put in perspective. Summaries of some studies are: The conclusion in the 1967 EPA report is that the addition of nitrogen from agricultural drainage will increase algal growth in the Bay-Delta waters. Nitrogen removal studies by biological treatment at the Agricultural Wastewater Treatment Center indicate that P alone had no effect, N alone caused increased growth, and N + P resulted in the most pronounced effect in tile drainage mixed with San Joaquin River water. The Kayser report indicates that, generally, nitrate increased maximum cell numbers (except in Lower Bay) and had little effect on growth rate. Secondary municipal or refinery effluent was either inhibitory or stimulatory depending on the waste concentrations and water source, although usually activated sludge effluent was stimulatory. Results of an 18-month study of the effects of waste discharges on Bay organisms are summarized. A method of using organisms from lower trophic levels (bacteria, algae, protozoa) to bioassay specific compounds and complex municipal wastes was developed. (See also W73-12391) (Jones-Wisconsin)
W73-12401

PCBS AND DDT,
Environmental Protection Agency, San Francisco, Calif. Water Quality Office.
Gerald L. Muth.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 223-226. 3 fig.

Descriptors: *Polychlorinated biphenyls, *DDT, *Molecular structure, Gas chromatography, Pesticides, Chemical analysis, Water sampling, Chlorinated hydrocarbon pesticides, *Pollutant identification.

Chemical analysis to determine presence and concentration of the organic compounds, PCBs (polychlorinated biphenyl) and DDT (dichlorodiphenyl-trichloroethane) in aquatic environments is difficult because of their similar molecular structures. As with the PCBs, the chlorine atoms of DDT can be located at different sites. In contrast to the PCBs, each DDT molecule will contain only two chlorine atoms. When produced the DDT will be approximately 80% pp'DDT and 12% op DDT, with the remaining 8% having other configurations including DDD. The two compounds can be distinguished from each other by using more than one gas chromatographic column with differing liquid phases. The procedure includes a standard hexane extraction, florish clean up, and then gas chromatographic determination. The computerized gas chromatographic mass spectrograph is used as final proof to determine the existence and differentiation between PCBs and other pesticides. The gas chromatographic peaks of the PCBs overlap not only with DDT, but also with lindane, aldrin, DDE, and other pesticides. DDT and PCBs also react similarly in aquatic environments; both accumulate in the fatty tissues of organisms, exhibit bio-magnification, are non-soluble in water, sorb onto sediment particles, and exhibit similar toxicity. (See also W73-12391) (Jones-Wisconsin)
W73-12402

THE SHAGAWA LAKE PROJECT: LAKE RESTORATION BY NUTRIENT REMOVAL FROM WASTEWATER EFFLUENT,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05D.
W73-12520

DETOXIFICATION OF KRAFT PULP MILL EFFLUENT BY AN AERATED LAGOON,
International Pacific Salmon Fisheries Commission, New Westminister (British Columbia).
For primary bibliographic entry see Field 05D.
W73-12529

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. III. STREAM RESPONSE,
Institute of Paper Chemistry, Appleton, Wis.
J. Weiner, and L. Roth.
Available from the Institute of Paper Chemistry, Appleton, Wis., ($12.00). Bibliographic Series, No 253, 1972. 141 p, 408 ref.

Descriptors: *Water pollution, *Bibliographies, *Pulp and paper industry, *Aquatic life, *Water pollution effects, Pollutants, Streams, Lakes, Oceans, Running waters, Aquatic animals, Aquatic plants, Toxicity, Industrial wastes, Pulp wastes, Effluents, Fish behavior, Fish, Waste water (Pollution).

This third part of a six-part annotated and indexed bibliography gives references to the ecological effects of various paper industry pollutants on rivers, lakes, oceans, and on their aquatic flora and fauna. The cited literature covers items published between about 1950 and 1970. (See also W73-12553) (Brown-IPC)
W73-12555

HEAVY METALS IN THE ENVIRONMENT.
For primary bibliographic entry see Field 05B.
W73-12604

ENVIRONMENTAL CONTAMINATION BY TOXIC METALS,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
For primary bibliographic entry see Field 05B.
W73-12605

ARSENIC AND CADMIUM IN THE ENVIRONMENT,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
S. L. Wagner.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, p 45-57, January 1973. 21 ref.

Descriptors: *Pollution effects, *Heavy metals, *Human pathology, *Arsenic, *Cadmium, Public health, Toxicity, Trace elements, Hazards.

Arsenic is ubiquitous in our environment and can be found in air, soil, or water. Most concentrations in water and air are in the range of a few parts per billion, whereas soil concentrations are often a few parts per million. The element does not appear

to accumulate in the food chain, and most foods do not contain high concentrations of arsenic with the single exception of seafoods. For example, whereas an arsenic tolerance in foods has been established as about 3 ppm, seafoods normally contain concentrations of arsenic ranging from 2 to 30 ppm. Cadmium occurs naturally in only trace amounts with the exception of a relatively high concentration found in association with zinc and lead. Most exposure has been from occupational exposure in workers involved in battery manufacture, electroplating, the making of alloys, welding and solders, ceramics, and vapor lamps. Cadmium is believed to inhibit the synthesis of iron into hemoglobin, and therefore may produce a secondary type of iron deficiency anemia. As with arsenic, the compound generally exhibits toxicity via the gastrointestinal route, but, again, the inhalation of cadmium fumes is much more toxic than the ingestion of the cadmium salts. Present threshold limit value for cadmium oxide is 0.1 mg per cu m of air. (See also W73-12604) (Woodard-USGS)
W73-12607

EFFECT OF HEAVY METALS ON FISH,
National Environmental Research Center, Corvallis, Oreg. Western Fish Toxicology Station.
G. Chapman.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, p 141-162, January 1973. 5 tab, 23 ref.

Descriptors: *Water pollution effects, *Heavy metals, *Fish, Toxicity, Ecology, Ecosystems, Food chains, Water chemistry, Trace elements, Chemical reactions, Water properties, Zinc, Copper, Cadmium.
Identifiers: *Pollution tolerance (Fish).

A review of literature with respect to the toxicity to fish of the heavy metals, zinc, copper, and cadmium, showed a wide range of values (for each metal), which were cited as 96-hr LC50 values, i.e., the concentration which kills 50% of the test animals in 96 hours. For zinc this range was 90 to 40,900 ppb; for copper 46 to 10,000 ppb; and for cadmium 470 to 9,000 ppb. Two general conclusions are that toxicity varies inversely with hardness, and that salmonids (trout and salmon) are more susceptible than most other common test species (primarily bluegills, Micropterus salmoides; and goldfish, Carassius auratus; and perhaps fathead minnows, Pimephales promelas.) Disregarding species and age, all of the other generally recognized factors which influence the toxicity of heavy metals to fish largely do so by influencing the rate of accumulation of the metal and, primarily, the rate of uptake of the metal. Thus pH, hardness and alkalinity, temperature, and dissolved oxygen level all affect the rate of uptake of the metal by changing either the biological availability of the metal by altering its form or by altering the rate and volume of ventilation of the fish. (See also W73-12604) (Woodard-USGS)
W73-12611

EFFECTS OF METALS ON FERTILIZATION AND DEVELOPMENT IN FISH,
Oregon Cooperative Fishery Unit, Corvallis.
J. D. McIntyre.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, p 163-168, January 1973. 8 ref.

Descriptors: *Water pollution effects, *Heavy metals, *Fish reproduction, Spawning, Fish eggs, Fish physiology, Toxicity, Trace elements, Fish types.
Identifiers: *Pollution tolerance (Fish).

A literature review shows that successful fertilization of fish may be prevented by toxic metals through effects on behavior. In long term studies of the effects of metals on various life history stages of the brook trout, males in exposure levels of 3.4 ppb cadmium were seized by severe muscle spasms as females began to move gravel in redd preparation. These males were generally unsuccessful in fertilizing the eggs and eventually died. Direct effects of metals on gamete survival may prevent successful fertilization. Results of an acute test in which samples of steelhead trout sperm were held in various concentrations of methylmercuric chloride for 30 minutes before they were combined with eggs indicated that at concentrations greater than 1 ppm, sperm viability was markedly reduced. The sexual development of fathead minnows in methylmercury is arrested at 0.25 ppb. Zebra fish that were permitted to spawn in several concentrations of phenylmercuric acetate produced fewer eggs at concentrations of 1 ppb or more as compared to lower concentrations. (See also W73-12604) (Woodard-USGS)
W73-12612

THE ROLE OF HEAVY METALS IN BIOLOGY,
Harvard Medical School, Boston, Mass.
F. S. Kennedy.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Resources Research Institute Report SEMN WR 016.73, p 169-182, January 1973. 1 tab, 2 ref.

Descriptors: *Water pollution effects, *Heavy metals, *Public health, *Human pathology, *Biochemistry, Environmental effects, Chemical reactions, Enzymes, Toxicity, Mercury, Cadmium, Lead.

The known biological involvement of mercury, cadmium, and lead can be expressed largely through their ability to form stable complexes with numerous biological ligands. These include SH and imidazole side chains of proteins, nitrogenous bases of DNA and RNA, as well as phosphate groups which occur in phospholipids, DNA and RNA, coenzymes, vitamins and metabolites. Aside from their widely known toxicity, mercury, cadmium, and lead all induce or enhance enzymatic activity in a large number of enzymes. Thus, when either mercury, cadmium, or lead is added to metal-free, bovine pancreatic carboxypeptidase A (a dual specificity zinc metalloenzyme), the reconstituted metalloenzymes all activity catalyze ester hydrolysis, the cadmium enzyme being a more active esterase then the natives zinc enzyme. However, unlike the native enzyme, the heavy metal substituted carboxypeptidases exhibit no peptidase activity so that cadmium can be regarded as both an activator and an inhibitor for this enzyme. That metals play a highly complex role in biological processes is obvious in the case of transition metals, which have been studied more extensively. For these, numerous metal ion deficiencies and diseases have been established including diseases which result from metal ion antagonisms or imbalances where deficiences of one metal relate to abnormal levels of second. (See also W73-12604) (Woodard-USGS)
W73-12613

SELENIUM IN THE ENVIRONMENT,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
P. H. Weswig.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, p 183-203, January 1973. 21 ref.

Descriptors: *Water pollution effects, *Heavy metals, *Public health, *Human pathology, *Animal pathology, Toxicity, Trace elements, Water pollution sources, Grasses.
Identifiers: *Selenium, Pollution tolerance.

Selenium is a relatively scarce element, its mean content in the crust of the each is about 0.09 ppm, and it is 66th in order of abundance. Selenium occurs especially in association with sulfur deposits and may also be found in combination with elements such as iron, lead, copper, and arsenic. In most soils not derived from sedimentary rocks the selenium concentration may be in the order of 0.05 ppm. In sea-bottom sediments and sedimentary rocks selenium values may be as high as 1.2 ppm. However, there are certain seleniferous regions in the world with much greater concentrations of selenium. In addition to South Dakota and Wyoming, seleniferous areas have been reported in Canada, Mexico, Ireland, Australia, Israel, and China. The safe upper limit for selenium in drinking water is 10 ppb according to the U.S. Department of Health. The presence of selenium in surface waters is a function of both pH and drainage slope with the highest concentrations coming generally from specific spring waters. Plants which grow on soils rich in selenium may concentrate the selenium and cause death to the animal consuming them. In Wyoming and North Dakota there are more then 24 species which may be classified as accumulators. Chronic selenium poisoning is caused by consuming plants containing from 10-30 ppm selenium. (See also W73-12604) (Woodard-USGS)
W73-12614

THE ZOOPLANKTON OF THE GULF OF GUINEA,
For primary bibliographic entry see Field 05A.
W73-12623

CRUSTACEAN PLANKTON AND THE EUTROPHICATION OF LAKES IN THE OKANAGAN VALLEY, BRITISH COLUMBIA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
K. Patalas, and A. Salki.
Journal of the Fisheries Research Board of Canada, Vol 30, No 4, p 519-542, April 1973. 14 fig, 8 tab, 19 ref.

Descriptors: *Eutrophication, *Zooplankton, *Crustaceans, *Copepods, *Waterfleas, Invertebrates, Spatial distribution, Dominant organisms, Oligotrophy, Mesotrophy, Secondary productivity, Secchi disks, Specific conductivity, Dissolved solids, Calcium, Sodium, Potassium, Magnesium, Trophic level, Chlorides, Dissolved oxygen, Water sampling, Sulfates, Water temperature, Lake Ontario, Physical, Chemical properties, Thermal stratification, Hypolimnion, Epilimnion, Phosphorus, Nutrients, Oxygen sag, Deficient elements.
Identifiers: *Okanagan Lake, *Skaha Lake, *Osoyoos Lake Macroinvertebrates, Phosphorus load, Species abundance, Cyclops bicuspidatus thomasi, Diaptomus ashlandi, Diaphanosoma leuchtenbergianum, Daphnia longiremis, Daphnia thorata, Wood lake, Kalamalka Lake, Lake Washington, Vertical distribution, Horizontal distribution, Transparency, Bosmina longirostris, Bosmina coregoni longispina, Leptodora kindtii, Diphnia pulex, Daphnia schoedleri, Sida crystallina, Epischura nevadensis, Nauplii, Copepodids, Cyclops vernalis, Lake Mendota, Scapholeberis mucronata, Diaphanosoma brachyurum, Holopedium gibberum.

In early September 1969 and late August 1971, the vertical and horizontal distribution of temperature, Secchi disc visibility, some chemical components, and zooplankton abundance in lakes Okanagan, Skaha, and Osoyoos were investigated. Lakes Kalamalka and Wood were sampled only in late August 1971. Four different basins could be distinguished in Lake Okanagan; total dissolved

solids, calcium, and electrical conductivity within the lake decreased gradually from north to south. Macroelement values within lakes Okanagan, Skaha, and Osoyoos were apparently not substantially different but Kalamalka and Wood lakes were about twice higher in sodium, potassium, magnesium and about 1.5 higher in the total dissolved solids. Four species of copepods and nine species of cladocerans were found with Cyclops bicuspidatus thomasi and Diaptomus ashlandi dominant in all five lakes. Diaphanosoma leuchtenbergianum and Daphnia longiremis were the most common cladocerans in all five lakes. Daphnia thorata was common in all except Wood Lake. Eighty-nine percent of the total plankters in Lake Okanagan were located in the upper 50-m layer. Relatively little horizontal variation was found within the lake but two areas showed in both years greater abundance of plankton than the remaining areas. Crustaceans were usually less abundant inshore than offshore. Volume of settled net plankton varied from 8 cu mm/sq mm in Okanagan Lake to 31 cu mm/sq mm in Wood Lake. No substantial changes in species composition of zooplankton, Secchi disc visibility, and dissolved oxygen in the hypolimnion were found relative to the data of 1935 reported by Rawson. In 1969 and 1971 net plankton volumes were about five and three times larger, respectively, than in 1935. Calculations of total phosphorus load indicated that lakes Okanagan and Kalamalka are still in the oligotrophic range but close to mesotrophy. Lake Wood is moderately eutrophic and lakes Skaha and Osoyoos showed a marked degree of eutrophy. The estimates for lakes Wood, Skaha, and Osoyoos were supported by the values of the hypolimnetic areal deficits characteristic for highly eutrophic lakes. The trend of changes in phosphorus load during the past century is presented and predictions are made about the load in 1990 in situations with and without phosphorus removal from sewage. (Holoman-Battelle)
W73-12624

BIOLOGICAL EFFECTS OF ARTIFICIAL DESTRATIFICATION AND AERATION IN LAKES AND RESERVOIRS-ANALYSIS AND BIBLIOGRAPHY,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
D. Toetz, J. Wilhm, and R. Summerfelt.
Available from the National Technical Information Service as PB-214 121, $3.00 in paper copy, $1.45 in microfiche. Report No. REC-ERC-72-33, October 1972. 119 p, 19 fig, 2 tab, 339 ref.

Descriptors: *Bibliographies, *Lakes, *Reservoirs, *Documentation, *Environmental effects, Water quality control, Impoundments, Physical properties, Water pollution effects, Trophic level, Thermal stratification, Chemical properties, On-site investigations, Laboratory tests, Benthos, Biological communities, Destratification, Biogeochemistry, Hypolimnion, Organic matter, Carbon dioxide, Hydrogen ion concentration, Oxidation, Turbidity.
Identifiers: *Data interpretation, *Artificial destratification, *Artificial aeration, *Applied research, *Biological effects, Mechanical devices, Transparency, Macroinvertebrates, Chironomids, Ephemeroptera, Silicon, Submerged weirs, Vertical distribution, Section Four Lake, Cox Hollow Lake, Lake Wohlford, Particulate nitrogen, Particulate matter, Kjeldahl nitrogen, Chironomus anthracinus, Ilyodrilus hammoniensis, Tubifex tubifex.

The state of the art of research concerning the biological effects of reaeration and destratification is described, with emphasis on lakes and reservoirs. Research needs are discussed, based on this review. Useful descriptions of methods and devices of reaeration and destratification are included. (Holoman-Battelle)
W73-12625

BIOLOGICAL EFFECTS OF OIL POLLUTION - SELECTED BIBLIOGRAPHY II,
Edison Water Quality Research Lab., N.J.
R. J. Nadeau, and T. H. Roush.
Available from the National Technical Information Service as PB-213 483, $4.50 in paper copy, $1.45 in microfiche. Report No. EPA-R2-72-055, November 1972. 62 p, 659 ref. EPA Project 15080 NDE.

Descriptors: *Bibliographies, *Documentation, *Oil pollution, *Water pollution effects, *Aquatic life, Environmental effects, Oily water, Shellfish, Marine animals, *Aquatic animals, Invertebrates, Dissolved oxygen, Microbial degradation, Oil spills, Oil industry, Ecosystems, Path of pollutants, Biological communities, Toxicity, Water birds, Benthos, Aquatic plants, Marine plants, Taste, Zooplankton, Sea water.
Identifiers: Natural waters, Carcinogenicity, Fate of pollutants, Crude oil, Hydrocarbons, Coastal waters, Grease, Substrate utilization, Petroleum residues, Mineral oil, Oil characterization, Aromatic compounds, Fuel oil, Marine environment, Diesel oil, Minnesota River, Sublittoral, 3 6 9 12 15 18-heneicosahexane, Petroleum distillates, Oil dispersants, Cod (Fish), Mytilus californianus, Morone saxatilis, Roccus saxatilis, Salmo gairdneri, Clupea carpio, Mugil cephalus.

This bibliography is an updating of the Federal Water Pollution Control Administration's 1969 report number DAST-19. References on the biological effects of oil include general aspects, specific spill incidents, general effects, carcinogenic effects, microbial utilization, and the effects on birds, fish, shellfish, marine and freshwater invertebrates, plants, and dissolved oxygen. (See also W70-02038) (Holoman-Battelle)
W73-12626

BIOLOGICAL ASPECTS OF LEAD: AN ANNOTATED BIBLIOGRAPHY - LITERATURE FROM 1950 THROUGH 1964. PARTS I AND II,
Cincinnati Univ., Ohio. Coll. of Medicine.
I. R. Campbell, and E. G. Mergard.
Available from GPO $6.75 a set NTIS microfiche $1.45 as PB-210 884. Report No AP-104, May 1972. 935 p, 4103 ref. Contract No. CPA 22-69-48. Grant No. USPHS ES 00159.

Descriptors: *Lead, *Bibliographies, *Abstracts, *Analytical techniques, *Lead radioisotopes, *Surveys, *Pollutant identification, Water pollution effects, Chemical analysis, Soil contamination, Documentation, Conferences, Public health, Water pollution, Air pollution, Path of pollutants, Human pathology, Phytotoxicity, Microorganisms, Pesticides, Waste water (Pollution), Legal aspects, Animal pathology.
Identifiers: *Organolead compounds, *Toxicology, *Pollutant effects, Mobilization, Fate of pollutants, Bioaccumulation, Biological materials, Quantitative analysis, Plants, Macroinvertebrates, Pb-212, Pb-210, Atomic absorption spectrometry, Pb-204, Pb-207, Pb-206, Pb-208, Natural waters, Marine environment, Chemical composition, Enzymatic inhibitors, Blood, Complexation, Metal chelates, Tunicates, Gasoline, Petroleum products, Excretion, Histochemistry, Plastics, Urine.

This bibliography has been compiled from several abstract sources and represents the scientific periodical literature covered by the principal abstracting and indexing services. Books and proceedings of conferences and symposia devoted to lead and its compounds are also included. The material is arranged in 10 sections covering such areas as environmental surveys, plants and animals, man, occupational exposure, pollution and effects, legal aspects, analytical methods, and chemistry and technology. (Holoman-Battelle)
W73-12627

A STUDY OF INORGANIC SALTS REQUIREMENTS AND EFFECT ON THE MORPHOLOGY OF MARINE BACTERIA,
Georgetown Univ., Washington, D.C. Dept. of Biology.
R. R. Colwell.
Available from the National Technical Information Service as AD-754 122, $3.00 in paper copy, $1.45 in microfiche. Final Report, October 15, 1972. 24 p, 86 ref. Task No NR 306-667. Contract No N00014-69-A-0220-0006.

Descriptors: *Marine bacteria, *Deficient elements, *Nutrient requirements, Electron microscopy, Magnesium, Sodium, Potassium, Cations, Hydrostatic pressure, Sodium chloride, Seawater, Water sampling, Water temperature, Microbial degradation, Chesapeake Bay, Publications, Thermal stress, Estuarine environment, Classification, Systematics.
Identifiers: *Ultrastructure, *Cell morphology, Pure cultures, Substrate utilization, Psychrophilic bacteria, Numerical taxonomy, Vibrio marinus, Potassium chloride, Magnesium chloride, Heterotrophic bacteria, Hydrocarbons, Vibrio parahaemolyticus.

A review is given of studies conducted to determine the distribution of marine bacteria in coastal and deep ocean areas, ultrastructural studies of salt-requiring, psychrophilic marine bacteria subjected to temperature and salt deprivation stresses, and the molecular biology and numerical taxonomy of marine and estuarine bacteria. A previously unreported area deals with experiments designed to investigate the effects on fine structure during growth of seawater-requiring strains in media of reduced Na and Mg content. The fine structure studies demonstrated that profound and, in most cases, irreversible changes occurred in these cells under the given test conditions. Cultures grown in Mg deficient medium demonstrated markedly aberrant intra-cytoplasmic and cell envelope morphology. Structural effects resulting from growth in media of reduced ionic strength, i.e., concentration of NaCl, KC1, and/or MgC12 of 0.1 or 0.01 times that of standard seawater, were varied, depending greatly on the given strain studied. In general, without Mg, cells demonstrated walls and membranes of aberrant, 'wrinkled' appearance. Much of the effort in this aspect of the work was expended in establishing the experimental conditions and 'normal' morphology of the test strains. By varying concentrations of Na, Mg, and Ca ions, it was found that V. marinus demonstrated marked changes in cell morphology under conditions of severe ion depletion, whereas more subtle structural changes occurred under conditions of unbalance or slightly lowered concentrations of these ions (concentrations slightly lower than normally found in seawater). (Holoman-Battelle)
W73-12628

AEROMONAS-INDUCED DEATHS AMONG FISH AND REPTILES IN AN EUTROPHIC INLAND LAKE,
Georgia Univ., Athens. Coll. of Veterinary Medicine.
E. B. Shotts, Jr., L. Martin, A. K. Prestwood, and J. L. Gaines, Jr.
J Am Vet Med Assoc. Vol 161, No 6, p 603-607. 1972. Illus.
Identifiers: *Aeromonas, Aeromonas-Shigelloides, Alligator-Mississippiensis, Eutrophic lakes, *Fish mortality, *Florida, Inland lakes, *Reptiles mortality, Trionyx-Ferox, Turtle.

A. hydrophila and A. shigelloides were associated with mortality among fish, turtles (Trionyxferox) and alligators (Alligator mississipiensis) of Lake Apopka, Lake and Orange Counties, Florida. Factors predisposing to infection included eutrophication of the lake and low dissolved O2 content of the water.--Copyright 1973, Biological Abstracts, Inc.
W73-12633

EFFECTS OF ZECTRAN INSECTICIDE ON AQUATIC ORGANISMS IN BEAR VALLEY CREEK, IDAHO,
Idaho Cooperative Fishery Unit, Moscow.
H. R. Gibson, and D. W. Chapman.
Trans Am Fish Soc. Vol 101, No 2, p 330-344. 1972. Illus.
Identifiers: Aquatic organisms, *Idaho, *Insecticides, Insects, Salvelinus-Malma, Terrestrial, Valley, *Zectran, Bear Valley Creek.

Assessed were effects of the experimental insecticide Zectran on aquatic organisms in Bear Valley Creek, Idaho in 1966. Hayden Creek drainage, nearby and not sprayed, served as a control. There was no significant fish mortality, and no effect on growth rate and condition of age O+, 1+, 2+ and 3+ dolly varden (Salvelinus malma). Insecticide applications did not increase emigration and intrastream movement of fish. No effects were noted on benthic aquatic insect numbers, but more insects drifted downstream for several hours beginning about 3 hr after spraying on 7 July 1966. Adult terrestrial insects, immature Heptageneidae and Rhyacophilidae, adult Chloroperlidae, and immature and adult Phryganeidae, Limnephilidae, and Blephariceridae increased in drift samples after spraying. It is concluded that Zectran insecticide damaged aquatic organisms very little.--Copyright 1973, Biological Abstracts, Inc.
W73-12634

MORTALITY CURVES OF BLUEGILLS (LEPOMIS MACROCHIRUS RAFINESQUE) SIMULTANEOUSLY EXPOSED TO TEMPERATURE AND ZINC STRESS,
Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.
D. T. Burton, E. L. Morgan, and J. Cairns, Jr.
Trans Am Fish Soc. Vol 101, No 3, p 435-441. 1972. Illus.
Identifiers: Acclimation, *Bluegills mortality, Lepomis-Macrochirus, Survival, *Temperature, Time, Toxicity, *Zinc.

Bluegills were exposed to a temperature Zn interaction consisting of 5 temperature regimes and 4 concentrations of Zn which were 1.0, 5.6, 10.0 and 32.0 mg Zn++/l. All of the above concentrations of Zn and a control were tested on 5 groups of fish which were acclimated to (1) 20 plus or minus 1C, (2) 30 plus or minus 1C and fish which were acclimated to 20 plus or minus 1C and were exposed to temperature increases at the following rates: (3) 1C/24 hr (4) 1C/1 hr and (5) 1.5C/10 min until a maximum of 30C was reached. A rise in temperature could reduce the survival time of bluegills exposed to lethal and sublethal concentrations of Zn. Reductions in survival time were a function of the rates at which the temperature was increased. Bluegills acclimated to 20 and 30 and then exposed to a lethal concentration of Zn (32 mg Zn++/l) at each temperature died 2.6 times faster at 30C than at 20C. Fish acclimated to 20C and exposed to a temperature increase of 1.5C/10 min died 4.8 times faster than fish maintained at 20C. A sublethal Zn concentration (5.6 mg Zn++/l) produced no mortalities in 20C acclimated bluegills in 96 hr but was toxic to fish when the temperature was increased from 20-30C at a rate of 1.5 C/10 min.--Copyright 1973, Biological Abstracts, Inc.
W73-12637

INFLUENCE OF LAND RECLAMATION AND WASTE WATER FROM PAPER MILL ON ENVIRONMENT OF 'NORI' (PORPHYRA TENERA) CULTURE FARM, (IN JAPANESE),
Kagawa Univ., Takamatsu (Japan). Dept. of Agricultural Engineering.
Y. Tanaka, and H. Inoue.
Kagawa Daigaku Nogakubu Gakuzyutu Hokoku. Vol 23, No 1, p 112-117. 1971. Illus.
Identifiers: Cultivation, Culture farms, Environment, *Japan, *Land reclamation, Pollution, Porphyra-Tenera, Productivity, Reclamation, Waste, *Paper mill wastes.

The tidal current and waste water quality in the adjacent water area were investigated. The waste water discharged from drain pipe reaches the Nori culture farm. The low productivity of this farm is due mainly to pollution with the effluents, low exchange of sea water, and dense cultivation.--Copyright 1973, Biological Abstracts, Inc.
W73-12639

EFFECT OF SCHOOL WATER FLUORIDATION ON DENTAL CARIES: FINAL RESULTS IN ELK LAKE, PA., AFTER 12 YEARS,
H. S. Horowitz, S. B. Heifetz, and F. E. Law.
Identifiers: *Dental caries, Elk Lake (Penn), *Fluoridation, Lake, *Pennsylvania, Potable water.

The water supply of a rural school was fluoridated for 12 yr at a level of 5 ppm, 4.5 times the optimum level for community fluoridation in the area. On the final survey, children who attended the school continually had 39% fewer decayed, missing and filled teeth than their counterparts on the base line. Late erupting teeth (canines, premolars, and second molars) demonstrated twice as much relative caries protection as early erupting teeth (incisors and first molars). In both categories of teeth, the greatest benefits were observed on proximal surfaces, as high as 69% for late erupting teeth.--Copyright 1973, Biological Abstracts, Inc.
W73-12647

SALMONELLA CONTAMINATION OF RIVERS AND SEWAGES IN FUKUYAMA CITY, (IN JAPANESE),
Hiroshima Univ. (Japan). Faculty of Fisheries and Animal Husbandry.
H. Hashimoto, Y. Hirata, S. Harada, and T. Shimizu.
J Fac Fish Anim Husb Hiroshima Univ. Vol 10, No 2, p 153-160. 1971. Illus. (English summary).
Identifiers: Fuduyama City (Japan), *Japan, Rivers, *Salmonella, Cities, *Sewage.

Water samples (110) collected from rivers, sewage and slaughterhouses in Fukuyama city in the eastern district of Hiroshima prefecture, Japan were examined for Salmonella, from Oct. 1967 to Dec. 1968. It was found that 23.6% (13/55) of the rivers, 22.2% (8/36) of the sewages and 36.8% (7/19) of the slaughterhouse sewage were contaiminated. The percentage of contamination is smaller in Fukuyama city than that in a larger city, such as Tokyo or Osaka. Thirty-three strains of Salmonella isolated from water samples were divided into the following 11 serotypes: S. derby, S. typhimurium, S. monevideo, S. thompson, S. mikawashima, S. narashino, S. enteritidis, S. meleagridis, S. give, S. senftenberg and S. westerstede. The environmental contamination of the area is increasing gradually, since new types of Salmonella, e.g., S. westerstede, etc. never found in Hiroshima prefecture before, were isolated.--Copyright 1973, Biological Abstracts, Inc.
W73-12648

THE EFFECT OF FLOODWATER ON OYSTERS IN MOBILE BAY,
Alabama Marine Resources Lab., Dauphin Island.
E. B. May.
Proc Natl Shellfish Assoc. 62: p 67-71. 1971. Illus.
Identifiers: *Alabama (Mobile Bay), Bays, Floodwaters, *Oysters, *Salinity, Water pollution effects.

Periodically, floodwaters entering Mobile Bay, Alabama, in winter and spring can lower the salinity to such a degree that oyster populations are affected. Oysters and oyster drills are killed and oyster setting is inhibited. The effects of low salinity were studied in 1970 and 1971 by quantitatively sampling oyster reefs and examining gonadal development. Most oysters survived long periods of exposure to salinity below 3%, but high mortality occurred on reefs where salinity was approximately 1%, for about 7 wk. Large errors were found in the box count method of estimating mortality.--Copyright 1973, Biological Abstracts, Inc.
W73-12658

EFFECTS OF FERTILIZATION ON AQUATIC PLANTS, WATER AND BOTTOM SEDIMENTS,
Rohm and Haas Co., Spring House, Pa. Research Div. Labs.
J. B. Ryan, D. N. Riemer, and S. J. Toth.
Weed Sci. Vol 20, No 5, p 482-486. 1972. Illus.
Identifiers: *Algae, Aquatic plants, *Bottom sediments, Cation, Elodea-Canadensis, Exchange, *Fertilization, Myriophyllum-Spicatum, Nutrients, Organic matter, Plants, Potamogeton-Pulcher, Sediments, Water pollution effects.

A 2-yr field study was conducted to determine the effects of fertilization on elodea (Elodea canadensis Michx.), eurasian watermilfoil (Myriophyllum spicatum L.), and heartleaf pondweed (Potamogeton pulcher Tuckerm.). Plants, water, and sediment were sampled and inorganic mineral contents determined. Water concentrations of NO3, NH4, P and K increased sharply following fertilization and generally reached maximum values within 7 days after treatment. Concentrations of these nutrients decreased rapidly after reaching maximum values. In the first yr, plant growth was not increased due to fertilization while in the second yr only heartleaf pondweed produced significantly greater yields. Elodea and eurasian watermilfoil grew better in the control environment, presumably due to less competition from algae, whose growth was increased by the addition of fertilizer. At the end of the study the top 1.3 cm of bottom sediment had increased in cation exchange capacity, organic matter, total N, and available P for all treatments while the underlying sediment remained relatively unchanged. Available P was greater in the surface of the fertilized sediment than in the surface of the control sediment.--Copyright 1973, Biological Abstracts, Inc.
W73-12661

DIATOM POPULATION DYNAMICS IN A CENTRAL IOWA DRAINAGE DITCH,
Bowling Green State Univ., Ohio. Dept. of Biology.
R. L. Lowe.
Iowa State J Res. Vol 47, No 1, p 7-59. 1972. Illus.
Identifiers: *Diatoms, *Drainage ditches, Gomphonema-Angustatum, *Iowa, Nutrients, Organic matter, Pollution, Seasonality.

Fifty-two consecutive weekly diatom samples were collected in 3 central Iowa drainage ditches from artificial substrates. Several chemical and physical environmental factors were measured simultaneously. The water at the 3 collecting stations differed mainly in the amount of organic enrichment present. Macronutrients did not appear to be limiting at any time during this study. Distinct population differences between the stations appear to reflect the degree of organic pollution. Five-hundred values were identified systemically and counted from each of the weekly samples, and a total of 67,000 were counted over the course of the study. One hundred and seventy-five species and varieties distributed among 28 genera were observed from the ditches; at least 28 of these species and varieties were unreported previously from Iowa. The density of diatoms was greatest in spring and summer at all 3 stations and the greatest number observed was 4.2 x 0.000001 cells/cm2 on July 25, 1969. Diatom densities became quite low during the late fall and winter. Gomphonema angustatum appeared in the largest numbers of any diatom and reached a maximum of 2.2 x 0.000001 cells/cm2. At one point it comprised 91% of the population.--Copyright 1973, Biological Abstracts, Inc.
W73-12665

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION I,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05G.
W73-12671-1

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION II, PRODUCT LISTING,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05G.
W73-12671-2

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION III, CHEMICAL INGREDIENT LISTING,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05G.
W73-12671-3

THE KINETICS OF MICROBIOLOGICAL MODIFICATION OF ORGANIC SUBSTANCES IN NATURAL WATERS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05B.
W73-12712

EFFECTS OF PESTICIDES IN WATER--A REPORT TO THE STATES.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-12752

NITRIFICATION IN SEDIMENTS OF SELECTED WISCONSIN LAKES,
Wisconsin Univ., Madison. Dept. of Soil Sciences.
R. L. Chen, D. R. Keeney, and J. G. Konrad.
J Environ Qual. Vol 1, No 2, p 151-154. 1972. Illus.
Identifiers: Lakes, *Nitrification, Organisms, Sediments, *Wisconsin, *Lake sediments.

Nitrification rates in lake sediment-water systems were investigated in the laboratory. Samples from Wisconsin eutrophic and oligotrophic hard- and soft-water lakes were incubated at 10C or 25C in the dark using nonstirred (i.e., quiescent) and stirred (magnetic stirrer) systems open to the atmosphere. Nitrate was not formed in the acid sediments from soft-water lakes. However, in calcareous sediments from hard-water lakes, nitrification proceeded readily when the systems were stirred to increase oxygen diffusion. Nitrate did not accumulate when the samples were not stirred. Experiments with N-Serve indicated that autotrophic organisms were mainly responsible for nitrification in the Lake Mendota samples. Considering the high oxygen diffusion rate required for nitrification in sediments, it is likely that this process occurs only at the sediment-water interface in oxygenated waters.--Copyright 1972, Biological Abstracts, Inc.
W73-12763

LENGTH-WEIGHT RELATIONSHIP AND CONDITION FACTORS OF FISHES FROM A SOUTH CAROLINA RESERVOIR RECEIVING THERMAL EFFLUENT,
Savannah River Ecology Lab., Aiken, S.C.
D. H. Bennett.
Prog Fish-Cult, Vol 34, No 2, p 85-87, 1972, Illus.
Identifiers: Effluents, Fish, *Length-weight ratios (Fish), Lepomis-macrochirus, Pomoxis-nigromaculatus, Reservoirs, *South Carolina, *Thermal effluents, *Bluegill, *Black crappie.

Length-weight relationships and coefficients of condition were compared for bluegill (Lepomis macrochirus) and black crappie (Pomoxis nigromaculatus) collected at the entrance of a thermal effluent into a South Carolina reservoir with those from another part of the reservoir at ambient temperatures. Black crappies from the heated station were significantly heavier and of better body condition than crappies living at ambient temperatures. Fingerling bluegills at the heated station exhibited significantly lower condition factors than those from the control stations. Thermal effluents will not necessarily alter the body condition of fishes living in receiving waters provided cooler refuge sites are available.--Copyright 1972, Biological Abstracts, Inc.
W73-12774

HYDROSTATIC PRESSURE IN RELATION TO THE SYNCHRONOUS CULTURE OF ALGAE IN OPEN AND CLOSED SYSTEMS,
Guelph Univ. (Ontario). Dept. of Botany.
H. Lue-Kim.
Int Rev Gesamten Hydrobiol. Vol 56, No 6, p 873-921. 1971.
Identifiers: *Algae, *Carbon dioxide, *Chlorella-Ellipsoidea, Cultures, *Hydrostatic pressure, Oxygen, Pressure, Synchronous cultures, Warburg effect.

Synchronous cultures of Chlorella ellipsoidea were maintained in an open system using conventional culture techniques. Under identical growing conditions but in a closed system designed to investigate hydrostatic pressure effects on synchronous algal cultures, synchronous cell division was not maintained. The most significant difference in the culture conditions between the open and the closed systems was the concentration of CO2 and O2 which remained relatively constant throughout the growth cycle in the open system, but varied continously during the cycle in the closed system. In the closed system O2 increased and CO2 decreased during the light period; in the dark the reverse was true. In order to investigate the effects of hydrostatic pressure on the physiology and morphology of algae, it was first essential to develop techniques for successful culture of algae in the closed system. Various modifications of culture conditions were made to obtain equal growth in both systems. The n number and ratios of increase in dry weight and protein were 4.0 in the open system but never more than 2.0 in the closed system. Results indicated that high O2 might be responsible for the discrepancies in the n number and ratios of increase of the other growth criteria between the open and closed systems. Photosynthetically evolved O2 in the closed system during the light period might be sufficient to cause the Warburg Effect. Possible ways of solving the problem of gas exchange in the closed system, and in overcoming the Warburg Effect were suggested. Both pressure and O2 concentration interact to influence the division of cells.--Copyright 1973, Biological Abstract, Inc.
W73-12798

BIOLOGICALLY ACTIVE COMPOUNDS IN THE AQUATIC ENVIRONMENT: THE UPTAKE AND DISTRIBUTION OF (1,1-DICHLORO-2-,2-BIS (P-CHLOROPHENYL) ETHYLENE), DDE BY CHIRONOMUS TENTANS FABRICIUS (DIPTERA: CHIRONOMIDAE),
Michigan State Univ., East Lansing. Dept. of Entomology.
For primary bibliographic entry see Field 05B.
W73-12804

HANDBOOK OF FISH DISEASES FOR VETERINARIANS AND BIOLOGISTS,
E. Amlacher.
Veb Gustav Fischer Verlag: Jena, East Germany. 1972. 2nd Ed. 378 p, Illus.
Identifiers: *Bacteria, Biologists, Book, Crabs, Diseases, *Fish diseases, Helminths, Pathology, Protozoans, Veterinarians, *Viruses (Fish).

Important data are presented on diseases of inland fish, including etiology, pathogenesis, epidemiology, pathological histology, histochemistry, therapy and prophylaxis. These diseases include viruses, bacterioses, mycoses, protozoonoses, helminthoses and those caused by dinoflagellates and parasitic crabs. Environmental factors are also covered. Examination techniques for each disease group and methods for shipping are discussed. A diagnostic chart lists symptoms, diseases and control measures. A subject index and bibliography are included.--Copyright 1973, Biological Abstracts, Inc.
W73-12813

METABOLIC EFFECTS OF PCB (POLYCHLORINATED BIPHENYLS) ON THE BROWN TROUT (SALMO TRUTTA),
Salmon Research Inst., Alvkarleo (Sweden).
N. Johansson, A. Larsson, and K. Lewander.
Comp Gen Pharmacol. Vol 3, No 11, p 310-314, 1972.
Identifiers: Anemia, *Brown trout, Cholesterol, Enlargement, Glycemia, Glycerides, Hyper, Liver, Salmo-trutta, *Trout (Metabolism), *Polychlorinated biphenyls.

Brown trout were given a total of 10 microgram PCB/g body-weight. The effects on different metabolites in blood, liver, and muscle were studied after 43 and 203 days. During the first 43 days the fish were fed. On day 43 the PCB-treated trout showed blood anemia, hyperglycemia, enlargement of the liver, and altered cholesterol metabolism. Between 43 and 203 days the fish were subjected to 4 mo. starvation followed by a refeeding period. On day 203 the PCB-treated trout showed higher body-weights, lower muscle glycogen levels, and a more pronounced decrease in liver triglycerides.--Copyright 1973, Biological Abstracts, Inc.
W73-12819

MERCURY IN FISH: SOME TOXICOLOGICAL CONSIDERATIONS,
University Hospital, Lund (Sweden). Dept. of Occupational Medicine.
S. Skerfving.
Food Cosmet Toxicol. Vol 10, No 4, p 545-556, 1972, Illus.
Identifiers: Aniamls, *Fish, Humans, *Mercury, Reviews (Literature), *Toxicological studies.

A literature review including animal experiments, metabolism of methylmercury and toxicity levels in man, and actions by various governments is presented.--Copyright 1973, Biological Abstracts, Inc.
W73-12826

DDT RESIDUES IN WHITE CROAKERS,
California State Dept. of Fish and Game, Sacramento.
W. T. Castle, and L. A. Woods, Jr.
Calif Fish Game. Vol 58, No 3, p 198-203. 1972.
Identifiers: Croakers, *DDT residues, Genyonemus-Lineatus, *White croakers.

The level of DDT residues in white croaker (Genyonemus lineatus) flesh (group A) and flesh with the skin left on (group B) was determined by gas liquid chromatography. The percent fat in group A and group B also was determined. There were significant differences ($P < .01$) between levels of DDT and between the percent fat in the 2 groups. The fat determined for group A was 3.76% (SE ± 0.37%) and for group B was 6.06% (SE ± 0.48%). The total DDT residue (including pp'DDT, its metabolites and isomers) for group A was 10.82 ppm (SE ± 0.96 ppm) and group B was 18.23 ppm (SE ± 1.95 ppm). The only residues detected at the limit of detection of 0.01 ppm were 1,1-dichloro-2-(o-chlorophenyl)-2- (p-chlorophenyl)ethane, (op'DDE); 1,1,1-trichloro-2- (o-chlorophenyl-2-(p-chlorophenyl)ethane, (op'DDT);1,1-dichloro-

2,2-bis (p-chlorophenyl)ethane, (pp'DDD); and 1,1,1-trichloroy2,2-bis (p-chlorophenyl)ethane, (pp'DDT). Many of the samples analyzed exceeded USA Food and Drug administration guideline tolerance of 5.0 ppm wet weight for total DDT.--Copyright 1973, Biological Abstracts, Inc.
W73-12835

THE NITROGEN CYCLE IN SEDIMENT--WATER SYSTEMS,
Wisconsin Univ., Madison. Dept. of Soil Science.
D. R. Keeney.
Journal of Environmental Quality, Vol 2, No 1, p 15-29, January-March 1973. 6 fig, 6 tab, 188 ref.

Descriptors: *Reviews, *Aquatic productivity, *Sediment-water interfaces, *Nitrogen cycle, Euthrophication, Environmental effects, Cycling nutrient, Nitrification, Dentrification, Nitrogen fixation, Water quality, Ecosystems, Algae, Bacteria, Biomass, Nitrogen, Sediments, Water temperature, Cyanophyta, Anabaena, Aquatic soils, Mineralogy, Soil properties, Lake morphology, Hydrogen ion concentration, Dissolved oxygen, Oxidation-reduction potential, Nutrients, Lakes, Electrodes, Respiration, Bacteria, Plankton, Incubation, Pseudomonas.
Identifiers: Mineralization, Immobilization, Ammonification, Nutrient interchange, Fate of pollutants, Anerobic respiration, N-15, Lake Mendota, Bantam Lake, Green Lake, Lake Kinneret, Nitrobacter, Bacillus, Achromobacter, Micrococcus, Nitrosomonas europea, Clostridium pasteurianum.

The available literature on the fate of nitrogen in waters and sediments is reviewed. Emphasis is placed on the importance of N to aquatic productivity, the pathways leading to N gains or losses in aquatic ecosystems, and the availability of N in sediments to the overlying waters. Important biological reactions include N mineralization and immobilization, nitrification and denitrification, and N fixation. The effect of sediment properties, lake morphology and environmental factors)pH, temperature, dissolved oxygen, oxidation-reduction) on the pathways and rates of N turnover are considered. The mixing process in sediments appear to be the most important in releasing sediment-N to waters. Several facets of the N cycle in waters and sediments require further elucidation. Research needs are outlined. (Mortland-Battelle)
W73-12843

PHYSIOLOGY AND CYTOLOGICAL CHEMISTRY OF BLUE-GREEN ALGAE,
MSU/AEC Plant Research Lab., East Lansing, Mich.
C. P. Wolk.
Bacteriological Reviews, Vol 37, No 1, p 32-101, March 1973. 16 fig, 2 tab, 839 ref.

Descriptors: *Plant physiology, *Reviews, *Cyanophyta, *Algae, *Cytological studies, *Photosynthesis, *Respiration, *Plant morphology, Nitrogen fixation, Genetics, Plant pigments, Lipids, Metabolism, Algal toxins, Nutrient requirements, Nitrogen compounds, Carbon, Sulfur, Reduction (Chemical), Nitrates, Nitrites, Ammonia, Amino acids, Plant viruses, Rhodophyta, Enzymes, Trace elements, Carbon dioxide, Organic compounds, Light, Temperature.
Identifiers: *Algal growth, Biochemical properties, Cyanophages, Ultrastructure, Biosynthesis, Substrate utilization, Synchronous cultures, Pure cultures, Culturing techniques, Electron transport, Acetates, Nucleic acids.

That information which is pertinent to the study of the developmental phenomena of blue-green algae has been expanded to encompass that which is know of their physiology and cytological chemistry. This review covers the latter two areas of interest. (Holoman-Battelle)
W73-12845

CARBON CYCLE IN SEDIMENT-WATER SYSTEMS,
National Environmental Research Center, Corvallis, Oreg.
P. C. Kerr, D. L. Brockway, D. F. Paris, and S. E. Craven.
Journal of Environmental Quality, Vol 2, No 1, p 46-52, January/March 1973. 1 fig. 72 ref.

Descriptors: *Reviews, *Carbon cycle, *Aquatic environment, *Sediment-water interfaces, *Aquatic microorganisms, Carbon dioxide, Sinks, Ecosystems, Adsorption, Sediments, Anaerobic bacteria, Aerobic bacteria, Algae, Aquatic productivity, Cycling nutrients, Aerobic conditions, Anaerobic conditons, Biodegradation, Path of pollutants, Secondary productivity, Carbon, Nutrients, Organic matter, Nitrogen, Phosphorus, Sorption, Clay minerals, Fungi, Yeasts, Phosphates, Carbonates, Primary productivity, Hydrogen ion concentration, Methane, Photosynthesis, Benthos, E. coli, Bioindicators, Degradation (Decomposition), Organic acids, Sedimentation, Metabolism, Bicarbonates, Bottom sediments.
Identifiers: Nutrient interchange, Mineralization, Heterotrophy, Organic carbon, Substrate utilization, Autotrophic nutrition, Heterotrophic nutrition.

Literature relevant to the extent and rate of carbon exchange between sediment and water is reviewed and the general implication of the role of carbon in regulating biological activity is discussed. Several conclusions are drawn from the review. The extent of adsorption of organics to clay minerals in natural aquatic ecosystems is not known. Sorption, desorption, sedimentation, and aerobic and anaerobic activity are affected by physical factors such as depth and mixing. Certain data indicate that organisms cannot utilize organic material sorbed to clay minerals; other data indicate that growth of certain bacteria and yest is stimulated by the addition of clay minerals. Although the exact substrate (s) is not known, aerobic and anaerobic decomposition of organic materials occurs in and on sediments. Aerobic decomposition seems to result in three different reactions affecting sediment-water carbon exchange: (1) Methane gas is produced and released from sediments. (2) Organic acids produced by anaerobes can serve as carbon sources for aerobes as well as aiding in solubilization of carbonates and affecting sorptive processes. (3) Carbon dioxide produced by anaerobes may be combined in some manner and remain in the sediments. The fact that most deep sediments retain organic carbon indicates that sediments may be sinks for organics. Possibly sediments serve as organic carbon sinks simply because the rate of sedimentation exceeds the rate of decomposition. (Mortland-Battelle)
W73-12846

FLOW OF MICROBIALLY FIXED NITROGEN IN A MODEL ECOSYSTEM,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05B.
W73-12847

A COMPARISON OF LIQUID SCINTILLATION AND GEIGER-MULLER ESTIMATES OF PRIMARY PRODUCTIVITY IN AN IN SITU EXPERIMENT,
Manitoba Univ., Winnipeg. Dept. of Zoology.
For primary bibliographic entry see Field 05A.
W73-12848

COMMUNITY STRUCTURE OF THE BENTHOS IN SCOTTISH SEA-LOCHS. II. SPATIAL PATTERN,
Dunstaffnage Marine Research Lab., Oban (Scotland).
J. Gage, and A. D. Geekie.
Marine Biology, Vol 19, No 1, p 41-53, March 1973. 6 fig, 5 tab, 23 ref.

Descriptors: *Spatial distribution, *Benthos, *Biological communities, *Benthic fauna, *Distribution patterns, Statistical methods, Environmental effects, Brackish water, Water sampling, Nematodes, Oligochaetes, Annelids, Copepods, Invertebrates, Data processing.
Identifiers: Data interpretation, *Macroinvertebrates, Epifauna, Infauna, Peloscolex benedeni, Aristias neglectus, Nereimyra punctata, Fabriciola baltica, Polydora quadrilabata, Thyasira flexuosa, Calanus finmarchicus, Aricidea catherinae, Terebellides stroemi, Paraonis lyra, Arcturella dilatata, Prionospio malmgreni, Sphaerosyllis bulbosa, Diplocirrus glaucus, Parvicardium ovale, Capitomastus minimus, Melinna palmata, Pholoe minuta, Prionospio cirrifera, Pherusa plumosa, Scalibregma inflatum, Paraonis gracilis, Spriorbis, *Loch Etive (Scotland), *Loch Creran (Scotland).

Spatial pattern in the distribution of the macrobenthos was studied from series of van Veen grab samples taken in a systematic pattern in Lochs Etive and Creran, W. Scotland. Each series was collected in a circular pattern at 7 stations. Plots of the variances of the numerical occurrences of the species in the samples against their means revealed greater deviation from the random expectation in the case of the 2 muddy sand stations than for the soft-mud stations, with only 1 exception. Two tests of goodness-of-fit to the Poisson distribution were also applied. The degree of concordance between the 3 measures of non-randomness applied was measured. The best correlation was found between values of the ratio of variance: mean and the test statistic D of the Kolmogorov-Smirnov goodness-of-fit test. It was not possible to discuss the biological basis for the pattern measured, except for a few species shown to be markedly aggregated. No clear trend emerged from attempts to detect differences in pattern with various ecological groupings of the macrobenthos. However, from the use of the test values as sample statistics illustrative of overall community pattern, it was possible to conclude that the fauna of the shallow, usually current-swept areas of muddy sand in the sea-lochs investigated was more aggregated than that on the usually deeper, soft-mud sediments in quieter water. (See also W73-08431) (Holoman-Battelle)
W73-12855

UPTAKE OF MERCURY BY CAGED RAINBOW TROUT (SALMO GAIRDNERI) IN THE SOUTH SASKATCHEWAN RIVER,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
J. F. Uthe, F. M. Atton, and L. M. Royer.
Journal of the Fisheries Research Board of Canada, Vol 30, No 5, p 643-650, May 1973. 1 fig, 4 tab, 10 ref.

Descriptors: *Mercury, *Absorption, *Rainbow trout, Water pollution effects, *On-site tests, *Canada, Bioindicators, Chemical analysis, Heavy metals.
Identifiers: *Biomonitoring, Methylmercury, Liver, Kidneys, Sample preservation, Atomic absorption spectrophotometry, Animal tissues, Salmo gairdneri, *South Saskatchewan River, Diefenbaker Lake, Pike Lake, Tobin Lake.

Rainbow trout were held in cages in the South Saskatchewan River to assess mercury uptake following curtailment of mercury discharges to the river. Six fish were taken from the cages at random at 2-week intervals and pooled homogenate samples were taken from the livers, kidneys, and headless, dressed carcasses. The total mercury content of samples was determined by flameless atomic absorption spectroscopy. There was a rapid uptake of mercury by the fish during the first warm summer period (1970) with mnutrients uch less uptake during the rest of the year. A second summer experiment (1971) produced no significantly different results suggesting that a long-term contamination exists within this river system. Analyses showed that the bulk of mercury present

in the fish carcasses was present as methylmercury. It was concluded that caged fish are good monitors of mercury pollution. The studies also showed that the cessation of mercury discharge into a river does not lead to elimination of mercury uptake in fish. (Mortland-Battelle)
W73-12857

SOME SHORT-TERM INDICATORS OF SUBLETHAL EFFECTS OF COPPER ON BROOK TROUT, SALVELINUS FONTINALIS,
National Water Quality Lab., Duluth, Minn.
R. A. Drummond, W. A. Spoor, and G. F. Olson.
Journal of the Fisheries Research Board of Canada, Vol 30, No 5, p 698-701, May 1973. 2 tab, 8 ref.

Descriptors: *Copper, *Toxicity, *Brook trout, *Fish behavior, *Bioindicators, *Laboratory tests, Water pollution effects, Monitoring, Lethal limit, Food habits, Bioassay.
Identifiers: *Pollutant effects, Cough frequency, Locomotor activity, Salvelinus fontinalis.

Laboratory tests were conducted to evaluate changes in cough frequency, locomotor activity, and feeding behavior as possible short-term indicators of the long-term effects of copper on brook trout. The trout were studied in plastic electrode chambers that allowed free movement in continuously flowing water. The electrodes measured respiratory and other movements, which were recorded on a polygraph. The effect of copper on coughing was measured by comparing cough frequency during a 24-hour exposure to that during the preceding 24-hour period. The effect on locomotor activity was measured during the first 2 hours of exposure and compared with activity the day before the test and with that of controls. Feeding behavior was monitored at 2 and 24 hours after exposure began and any departure from normal aggressive feeding patterns was recorded. Changes occurred in all three activities at copper concentrations near 9.5 micrograms/1. Each response thus showed promise as a short-term indicator of the concentration range at which chronic exposure might have no permanent effect. Cough frequency was the best of the three for showing stress acccording to the copper concentration, but the change developed more slowly than in locomotor activity. (Mortland-Battelle)
W73-12859

NITROGEN RELEASE FROM LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Program.
For primary bibliographic entry see Field 05B.
W73-12860

IDENTIFICATION OF THE LIMITING NUTRIENT AND SPECIFIC GROWTH RATE,
Ohio State Univ., Columbus.
R. M. Sykes.
Journal Water Pollution Control Federation, Vol 45, No 5, p 888-895, May 1973. 3 fig, 1 tab, 11 ref.

Descriptors: *Cultures, *Mathematical models, *Growth rates, *Microorganisms, *Limiting factors, *Essential nutrients, *Theoretical analysis, Kinetics, Nutrient requirements.
Identifiers: Chemostat, Batch cultures, Continuous cultures, Culture media, Monod model.

The simplest mathematical theory of continuous microbial cultures, that for the chemostat, contains the corollary that a given growth medium may contain more than one limiting nutrient. If it does, in chemostat cultures each nutrient is limiting in a different, nonoverlapping dilution rate range, and in batch cultures each nutrient limits in different growth stages. It is possible to derive from the differential equations describing the microbial culture both the conditions permitting multiple limiting nutrients and the boundaries of each nutrient's range of limitation. These deductions are a consequence of defining the limiting nutrient as the nutrient that controls the organism's specific growth rate. Deductions can be derived for any model of microbial culture. (Mortland-Battelle)
W73-12861

BENTHIC INVERTEBRATES IN LAKE ASHTABULA RESERVOIR, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
J. J. Peterka.
Am Midland Nat. Vol 88, No 2, p 408-418, 1972.
Identifiers: *Benthic invertebrates, Lakes, *North Dakota (Lake Ashtabula), Reservoirs, *Eutrophic lakes.

The kinds and amounts of benthic invertebrates in Lake Ashtabula, a 20-yr-old eutrophic reservoir in southeastern North Dakota, were recorded at a single station located 3.2 km N of the dam. The average standing crops of benthic invertebrates in the sampling station collected during April, June and Aug. 1967 were 6.4, 8.2 and 7.1 g m-2, respectively, and 1831, 2622 and 1295 individuals m-2. Organisms in the 0-3 m depth zone accounted for 28% by number and 53% by weight of all organisms present in the study area from April to Aug; 56% by number and 37% by weight were in the 3-8 m depth zone; and 16% by number and 9% by weight were in the 8-12 m depth zone. The quantity and kinds of its benthic invertebrates indicate Lake Ashtabula is eutrophic when compared with data available from other lakes that are also unstratified during open-water periods.--Copyright 1973, Biological Abstracts, Inc.
W73-12863

SOME EFFECTS OF EVAPORATION SUPPRESSION ON RESERVOIR ECOLOGY,
North Texas State Univ., Denton. Dept. of Biological Sciences.
J. K. G. Silvey, H. B. Sharp, K. L. Dickson, R. C. Allison, and J. C. Stiles.
Journal of the American Water Works Association, Vol 65, No 4, p 260-268, April 1973. 12 fig, 4 tab, 24 ref.

Descriptors: *Aquatic algae, *Aquatic insects, *Reservoirs, *Evaporation control, *Hexadecanol, *Water quality, Aquatic bacteria, *Annelids, *Benthos, Aquatic fungi, Freshwater fish, Monomolecular films, Midges, Color, Specific conductivity, Pseudomonas, Diptera, Water sampling, Turbidity, Tubificids, Phosphates, Nitrates, Conductivity, Hydrogen ion concentration, Carbonates, Bicarbonates, Sulfates, Chlorides, Dissolved oxygen, Carbon dioxide, Pyrrophyta, Iron, Cultures, Gas chromatography, Water temperature, Dinoflagellates, Surface tension, Calcium, Hardness (Water), Chlorophyta, Cyanophyta, Chrysophyta, Mayflies, *Oklahoma.
Identifiers: Standard methods, Bacillus, Macroinvertebrates, *Lake Hefner (Okla), Kids Lake, Actinomycetes, Alcaligenes, Flavobacterium, Brevibacterium, Hexagenia.

Studies were made in Lake Hefner, an Oklahoma City water supply reservoir, to determine the effects of hexadecanol on biological, chemical, and physical aspects of water quality. Hexadecanol is a chemical applied to suppress evaporation. Samples were taken twice a week from five stations during summer months and analyzed for bacteria, algae, phosphates, and nitrates. Chemical and physical analyses for hardness, temperature, specific conductance, pH, carbonates, bicarbonates, sulfates, chlorides, DO, CO2, iron, color and turbidity were performed weekly. During winter months, monthly samples were analyzed in a like manner. The study was conducted over a 5-year period. The application of hexadecanol apparently had no detectable deleterious effect on chemical water quality. Some stimulation in the population of certain bacterial organisms could be seen, but only when a composite was made of all data from each station. A slight correlation could also be made between laboratory studies and the organisms shown to be stimulated in the reservoir. But since other conditions may have had an effect, it was not possible to conclude that population increases were due entirely to hexadecanol. There was no apparent difference in bottom fauna between periods of coverage and non-coverage. It was concluded that hexadecanol in the concentrations used had no detectable effect on the ecology of the reservoir. (Mortland-Battelle)
W73-12869

STREAM-VELOCITY EFFECTS ON THE HEAVY-METAL CONCENTRATIONS,
Alabama Univ., University. Dept. of Biology.
For primary bibliographic entry see Field 05B.
W73-12870

PHYSIOLOGICAL CHANGES IN MYTILUS EDULIS L. INDUCED BY TEMPERATURE AND NUTRITIVE STRESS,
Leicester Univ. (England). Dept. of Zoology.
B. L. Bayne.
Journal of the Marine Biological Association of the United Kingdom, Vol 53, No 1, p 39-58, February 1973. 9 fig, 7 tab, 27 ref.

Descriptors: *Thermal stress, *Animal physiology, *Laboratory tests, *Physiological ecology, *Environmental effects, Nitrogen, Animal metabolism, Water temperature, Mussels, Mollusks, Invertebrates, Water pollution effects, Ammonia, Bioassay, Proteins, Carbohydrates, Lipids, Summer, Autumn, Winter.
Identifiers: *Nutritive stress, Seasonal variation, Oxygen consumption, Excretion, Blood, Metabolites, Sugars, alpha-Amino nitrogen, Macroinvertebrates.

The results of the determination of oxygen consumption, nitrogen excretion (both as ammonia-N and alpha-amino-N) and of the concentration of blood metabolites in Mytilus edulis are described in relation to seasonal cycle and to changes induced by temperature and nutritive stress in the laboratory. Four routine stress experiments were set up using 100 animals of uniform length per experiment in aquaria with re-circulating seawater. Three levels of oxygen consumption rate were identified, viz. standard, routine and active. Animals fed above the maintenance energy requirement adjust their oxygen consumption rate to a routine level. Animals fed below the maintenance requirement reduce their oxygen consumption rate to a standard level within 35-40 days. The routine rate is seasonally variable, with high values in the winter and low values in the summer. The standard rate also varies seasonally. The exponent that relates oxygen consumption to body size varies from a high value in the summer to a lower value in the winter. Rates of excretion of ammonia-N and alpha-amino-N vary seasonally from high values in winter to low values in summer. Significant amounts of alpha-amino-N are lost from the body at all times, and especially during stress. In unstressed animals the atomic ratio of oxygen consumed to ammonia-N excreted remains at about 100 for most of the year, but rises to much higher values in the summer. The relationship observed in the ON values under stress suggests that the O:N ratio is a sensitive index of nutritive stress in Mytilus. Changes in blood sugars were interpreted in terms of an index of blood sugar energy reserve, which varies with stress. Temperature and nutritive stress is seen to alter seasonal steady-state values of physiological indices. New steady states are established as a result of stress, and the measured shifts in these indices provide estimates of the physiological effects of environmental change. (Holoman-Battelle)
W73-12878

THE MECHANISMS OF NITROGEN ASSIMILATION IN PSEUDOMONADS,
Newcastle-upon-Tyne Univ. (England). Dept. of Microbiology.
C. M. Brown, D. S. Macdonald-Brown, and S. O. Stanley.
Antonie van Leeuwenhoek, Vol 39, No 1, p 89-98, 1973. 4 fig, 2 tab, 17 ref.

Descriptors: *Nitrogen, *Aerobic bacteria, *Cultures, *Enzymes, Nitrates, Nutrient requirements, Deficient elements, Environmental effects, Marine bacteria, Path of pollutants, Ammonia, Temperature, Hydrogen ion concentration, Assay.
Identifiers: *Assimilation, *Pseudomonads, *Substrate utilization, Enzymatic activity, Pseudomonas aeruginosa, Pseudomonas fluorescens, Chemostat, NAD, NADP, Glutamine synthetase, Glutamate dehydrogenase, Psychrophilic bacteria, L-glutamine: 2-oxoglutarate aminotransferase, Culture media, Glutamate, Fate of pollutants.

Pseudomonas aeruginosa, Ps. fluorescens and 3 marine psychrophylic pseudomonads were grown in chemostat cultures with nitrate ammonia or glutamate as nitrogen source. In cultures grown on nitrate (either carbon- or nitrogen-limited) and in ammonia nitrogen-limited cultures ammonia was assimilated via the glutamine synthetase/L-glutamine: 2-oxoglutarate aminotransferase (GS/GOGAT) pathway. With an excess of ammonia in the culture however ammonia was assimilated via glutamate dehydrogenase (GDH), and glutamine synthetase (GS) was either present only at low levels or absent. Two distinct GDH activities were detected in all 5 bacteria, one specific to NAD and one to NADP. The presence of these activities was determined by the environment in which cells were grown. These activities showed differences with respect to substrate affinity (Km values) for ammonia, incubation temperature and to a lesser extent pH and may involve separate GDH isoenzymes. GS from the marine bacterium PL sub 1 had a very high affinity for ammonia (Km of 0.3 mM) but a low affinity for glutamate (Km of 19 mM). (Holoman-Battelle)
W73-12881

THE UTILIZATION OF LEAF LITTER BY STREAM DETRITIVORES,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
K. W. Cummins, R. C. Petersen, F. O. Howard, J. C. Wuycheck, and V. I. Holt.
Ecology, Vol 54, No 2, p 336-345, Early Spring 1973. 3 fig, 9 tab, 27 ref.

Descriptors: Animal growth, *Mortality, Aquatic insects, *Laboratory tests, Natural streams, *Secondary productivity, Hickory trees, Caddisflies, Stoneflies, Immature growth stage, Mayflies, Standing crops, Aquatic fungi, Diptera, Larvae, Growth rates, Decomposing organic matter.
Identifiers: *Detritivores, *Leaf litter, *Heterotrophic nutrition, Dissolved organic matter, Particulate organic matter, Flies, Species density, Food conversion, Carya glabra, Pignut hickory, Lunulospora curvula, Crane flies, Tipula abdominalis, Tipula caloptera, Pycnopsyche lepida, Pycnopsyche guttifer, Pycnopsyche scabripennis, Pteronarcys pictetii, Stenonema fuscum, Stenonema tripunctatum, Stenonema interpunctatum, Stenonema canadense, Substrate utilization, Stenonema spp, Tipula spp, Pycnopsyche luculenta, Pteronarcys scotti, Stenonema pulchellum, Neiophylax concinnus.

Investigations of large and fine particle feeding detritivores (shredders and collectors) fed on conditioned hickory leaves (Carya glabra) revealed density-dependent intra- and interspecific interactions. Shredder (Tipula and Pycnopsyche) growth rates ranged from 0.47 to 1.53 percent increase in body wt/day depending upon density, species combinations, and culture temperature. Collector (Stenonema) growth rate ranged from 0.13 to 1.80 percent body wt/day, being greatest at high densities, particularly in combination with shredders. Food consumption ranged from 15.7 to 33.2 percent body wt/day for shredders and 4.0 to 23.2 percent body wt/day for collectors. After non-shredder feeding losses are accounted for, estimated shredder standing crop required to account for processing of reported leaf litter inputs compare generally to measured shredder standing crop. (Holoman-Battelle)
W73-12882

DISPERSION, DISPERSAL, AND PERSISTENCE OF THE ANNUAL INTERTIDAL ALGA, POSTELSIA PALMEFORMIS RUPRECHT,
Scripps Institution of Oceanography, La Jolla, Calif.
P. K. Dayton.
Ecology, Vol 54, No 2, p 433-438, Early Spring 1973. 3 fig, 1 tab, 9 ref.

Descriptors: *Phaeophyta, *Intertidal areas, *Ecological distribution, *Persistence, Dispersion, Marine algae, Competition, Succession, Crustaceans, Biological communities, *Washington, Mussels, Invertebrates, Annual, Distribution patterns.
Identifiers: *Postelsia palmaeformis, *Colonization, Mytilus californianus, Species interaction, Chthamalus dalli, Balanus glandula, Balanus cariosus, Pollicipes polymerus, Gooseneck barnacle, Acorn barnacle, Macroinvertebrates.

Postelsia palmaeformis is an annual brown alga that occurs on the Washington coast at upper intertidal sites subjected to extreme wave exposure. The alga occurs in patches within beds of Mytilus californianus, the competitive dominant in this region. Postelsia sporophytes are shown to colonize experimentally cleared spaces in beds of Mytilus with no concurrent colonization of adjacent uncleared controls. However, unlike many annual algae which have high spore dispersal abilities, Postelsia seems to have an effective distance of sporophyte colonization also. Postelsia patches are maintained through time by settlement of Postelsia on other algal and animal species. By increasing the probability of both being ripped from the substratum, and by overgrowing and smothering barnacles, Postelsia sporophytes clear primary substratum for the eventual use of sporophytes of their own species. (Holoman-Battelle)
W73-12883

THE USE OF FISH AS SENSORS IN INDUSTRIAL WASTE LINES TO PREVENT FISH KILLS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. Cairns, Jr., R. E. Sparks, and W. T. Waller.
Hydrobiologia, Vol 41, No 2, p 151-167, March 29, 1973. 5 fig, 7 tab, 10 ref.

Descriptors: *Industrial wastes, *Toxicity, *On-site data collections, *Water pollution effects, *Methodology, Movement, Bioindicators, Automatic control, Effluents, Water pollution control, Fish populations, Sunfishes, Fishkill, Water pollution, Zinc, Freshwater fish, Data collections, Sampling, Industrial plants, Water quality control.
Identifiers: *Bluegills, *Biomonitoring, Breathing, Minicomputers, Continuous flow system, Lepomis macrochirus, Data interpretation.

The use of movements and breathing rates of bluegill sunfish as in the detection of sublethal concentrations of zinc can be applied to industrial waste lines. Fish movement patterns and breathing rates would be monitored according to methods described in previous papers. Since industrial waste and water qualities are apt to vary unpredictably, a redundant detection system is desirable. If that monitoring system were automated the rate of data acequisition and analysis could be greatly speeded up. At an actual industrial site, a monitoring unit would be located on each waste stream in the plant and on the combined waste stream. The experimental fish in each unit would be exposed to waste diluted with water from the river above the plant, and control fish would be exposed to upstream water alone. The information from each monitoring unit could be analyzed by a central data processor, and when there was a warning response, the industry could tell which waste stream was at fault. If the problem was outside the plant, the control fish would show responses. It is likely that 'fish sensors' in continuous monitoring units at industrial sites can warn of developing toxic conditions in time to forestall acute damage to the fish populations in streams. (Holoman-Battelle)
W73-12889

ARTIFICIAL RESERVOIR DESTRATIFICATION EFFECTS ON PHYTOPLANKTON,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Forestry and Wildlife Science.
R. T. Lackey.
Journal Water Pollution Control Federation, Vol 45, No 4, p 668-673, April 1973. 3 fig, 1 tab, 15 ref.

Descriptors: *Phytoplankton, *Reservoirs, *Environmental effects, *Aeration, Chlorophyta, Cyanophyta, Sampling, Pyrrophyta, Aquatic algae, Diatoms, Chlorophyta, Distribution patterns, Plant populations, Dinoflagellates.
Identifiers: *Thermal destratification, Vertical distribution, Sample preservation, Volvox, Mallomonas, Seasonal variation, Eudorina elegans, Sphaerozosoma aubertianum, Staurastrum gracile, Ceratium hirundinella, Asterionella formosa, Fragilaria crotonensis, Melosira granulata, Anabaena flos-aquae, Aphanizomenon flos-aquae, Gomphosphaeria lacustris.

A 19-ha Colorado montane reservoir was kept thermally destratified by continuous aeration for 1 yr. Samples were taken on a single day near the middle of each month from five permanently marked stations and consisted of four 3-liter hauls taken at each 0.5-m depth within each 2-m stratum. Samples were strained through a 75-mm mesh net, preserved in 4 percent formaldehyde, and enumerated in Palmer counting cells. Individual plankters were enumerated where practical, but colonies and chains were also treated as individuals. Statistical methods were used in analyzing the results. Total phytoplankton abundance was reduced, but phyla varied in their response. Green phytoplankton (Chlorophyta) decreased in abundance and diatoms (Bacillariophyceae) were nearly eliminated during destratification. Blue-green algae (Cyanophyta), however, increased in abundance and this phenomenon may limit the use of destratification in water management. Vertical distribution of phytoplankton was not affected by destratification. (Mortland-Battelle)
W73-12895

EFFECT OF INCUBATION TEMPERATURE ON THE MACROMOLECULAR AND LIPID CONTENT OF THE PHYTOFLAGELLATE OCHROMONAS DANICA,
Queens Coll., Flushing, N.Y. Dept. of Biology.
S. Aaronson.
Journal of Phycology, Vol 9, No 1, p 111-113, March 1973. 4 tab, 17 ref.

Descriptors: *Cytological studies, *Thermal stress, *Environmental effects, Proteins, Lipids, Aquatic algae, Carbohydrates, Biomass, Thermal pollution, Cultures, Incubation, Water pollution effects, Growth rates, Chlorella, Eutrophication, Food chains, Degradation (Decomposition), Temperature, Chrysophyta.
Identifiers: *Ochromonas danica, *Chemical composition, RNA, Culture media.

Ochromonas danica grown in a chemically defined medium under controlled conditions at different incubation temperatures showed marked changes in chemical composition and secretory pattern. As the incubation temperature rose from 15 to 30C, the cell number per unit volume of medium increased; the cell mass reach a maximum and then declined slightly, and the weight per single cell decreased. The chemical composition of the cells changed with increasing temperature: carbohydrates decreased dramatically; proteins quadrupled at 20C and then declined 25 percent; lipids increased to about 40 percent of maximum at 30C. The extracellular secretion by the cells of carbohydrates seemed to increase and then decline; RNA decreased; proteins increased; and lipids remained approximately constant, as the temperature increased. Increased oxygen utilization in the decay process that may result from these changes and lower oxygen solubility in warmer waters may well enhance the eutrophication process already rampant in much of the aquatic environment. On the other hand, knowledge of the ecological changes produced by thermal pollution at the primary food chain level may permit the exploitation of this pollutant for aquaculture. (Moreland-Battelle)
W73-12896

SWIMMING PERFORMANCE OF YOUNG ATLANTIC SALMON (SALMO SALAR) AS AFFECTED BY REDUCED AMBIENT OXYGEN CONCENTRATION,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
M. N. Kutty, and R. L. Saunders.
Journal of the Fisheries Research Board of Canada, Vol 30, No 2, p 223-227, February 1973. 3 fig, 14 ref.

Descriptors: *Atlantic salmon, *Oxygen sag, *Fish behavior, *Swimming, *Juvenile fish, *Laboratory tests, *Water pollution effects, Dissolved oxygen, Bioassay, Smolt, Tilapia, Cechlids, Rainbow trout, Freshwater fish, Fish physiology, Water quality standards, Oxygen requirements, Cold-water fish.
Identifiers: Salmo salar, Salmo gairdneri, Carassius auratus, Goldfish.

As oxygen concentraion is lowered, a point is reached, the critical oxygen level, at which juvenile Atlantic salmon (salmo salar) stop swimming in a tunnel respirometer. At concentrations just above the critical level, salmon frequently lose position in the upstream end of the respirometer and fall back to the downstream end while still headed into the current. There appears to be a progressive decrease in locomotor activity, indicated by reduced tailbeat frequency, on approaching the critical concentration. Swimming performance of the Atlantic salmon is more highly dependent on oxygen concentration than is that of rainbow trout (Salmo gairdneri), goldfish (Carassius auratus), or Tilapia. The critical oxygen level for salmon swimming at 55 cm/sec is about 4.5 mg/liter, in comparison with 2.0 for rainbow trout, 1.7 for goldfish, and 1.0for Tilapia. Between the minimum speed at which a salmon swims steadily and the maximum of which the fish is capable, the critical oxygen level rises with increase in swimming speed. Stoppage of swimming at the critical level is not owing to fatigue; fish resume swimming within minutes of the oxygen level being raised only slightly. The high critical oxygen levels for salmon in relation to other species including rainbow trout, another salmonid, point up the need for maintenance of stringent water quality criteria for oxygen levels in salmon rivers. (Holoman-Battelle)
W73-12897

A RELATIONSHIP BETWEEN HETEROTROPHIC UTILIZATION OF ORGANIC ACIDS AND BACTERIAL POPULATIONS IN WEST BLUE LAKE, MANITOBA,
Manitoba Univ., Winnipeg. Dept. of Botany.
G. G. C. Robinson, L. L. Hendzel, and D. C. Gillespie.
Limnology and Oceanography, Vol 18, No 2, p 264-269, March 1973. 2 fig, 2 tab, 15 ref.

Descriptors: *Organic acids, *Aquatic bacteria, Adsorption, Organic compounds, Water sampling, Cultures, *Canada.
Identifiers: *Substrate utilization, *Heterotrophic nutrition, *Heterotrophic bacteria, Bacterial populations, *Blue Lake (Manitoba), Data interpretation, Plate counts, Lactic acid, Pyruvic acid, Fumaric acid, Malic acid, Acetic acid, Succinic acid, Glycolic acid, Citric acid, Formic acid, Sample preparation, Cytophaga.

The relationship between the concentration of nine organic acid substrates (lactic, pyruvic, fumaric, malic, acetic, succinic, glycolic, citric, and formic) and their velocities of uptake have been investigated in West Blue Lake, Manitoba. Maximum uptake velocities were ranked and compared with bacterial plate counts on minimal media supplemented with single organic acids. Water samples from a 5-m depth were screened through a 153-micron Nitex screen to remove most of the zooplankton. Subsamples were place in an appropriate number of sterile 25-ml bottles and inoculated with the C-14 labeled organic acid substrates. All bottles were incubated in the lake for a 12-hr period at a depth of 5 m. After incubation the samples were filtered through 0.45-micron cellulose acetate filters each of which was washed with sterile water and placed into scintillation vials containing Bray's fluor. Radioactivity was determined in a scintillation counter and calculations were made to determine bacterial numbers in relation to each organic acid. For pyruvic, fumaric, malic, acetic, glycolic, and citric acids an excellent correlation (r equals 0.98) existed between plate counts and acid uptake indicating that for these substrates maximum velocities of uptake are indeed indicative of actual bacterial populations. (Holoman-Battelle)
W73-12903

ANNUAL PRODUCTION OF A STREAM MAYFLY POPULATION: A COMPARISON OF METHODS,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
For primary bibliographic entry see Field 05B.
W73-12905

ESTIMATION OF MORTALITY COEFFICIENTS FROM FIELD SAMPLES OF ZOOPLANKTON,
Scripps Institution of Oceanography, La Jolla, Calif.
E. W. Fager.
Limology and Oceanography, Vol 18, No 2, p 297-301, March 1973. 1 fig, 2 tab, 3 ref.

Descriptors: *Zooplankton, *On-site data collections, *Estimating, Computer programs, Animal populations, Mathematical studies, Programming languages, Animal physiology, Invertebrates.
Identifiers: *Mortality coefficients, Population dynamics, Calanus helgolandicus.

Point estimates of mortality of zooplankton in the field, based on relative numbers of individuals of different developmental stages observed in samples, require either a knowledge of the initial input of young or assumptions about constancy of input and constancy of mortality over adjacent stages. As the initial input is rarely known and the assumptions of constancy are probably often violated, the resulting uncertainty should be made evident in the estimates. This can be done by reporting the ranges of values of the mortality coefficients that would be consistent with the observed relative numbers of individuals. Methods of calculating these ranges are given. (Holoman-Battelle)
W73-12906

AN EVALUATION OF LIQUID SCINTILLATION COUNTING TECHNIQUES FOR USE IN AQUATIC PRIMARY PRODUCTION STUDIES,
Queen Elizabeth Coll., London (England). Dept. of Biology.
For primary bibliographic entry see Field 05A.
W73-12907

MEMBRANE FILTER RETENTION--A SOURCE OF ERROR IN THE C-14 METHOD OF MEASURING PRIMARY PRODUCTION,
Atomic Energy of Canada Ltd., Chalk River (Ontario. Environmental Research Branch.
For primary bibliographic entry see Field 05A.
W73-12908

THE REDUCTION OF COPPER TOXICITY IN A MARINE COPEPOD BY SEDIMENT EXTRACT,
British Columbia Univ., Vancouver. Inst. of Oceanography.
A. G. Lewis, P. Whitfield, and A. Ramnarine.
Limnology and Oceanography, Vol 18, No 2, p 324-326, March 1973, 1 fig, 7 ref.

Descriptors: *Copper, *Toxicity, *Copepods, *Attenuation, *Bottom sediments, Water pollution effects, *Growth stages, Sediments, Heavy metals, Bottom sampling, Crustaceans, Invertebrates, Sea water, Zooplankton, Water pollution, Larval growth stage, Embryonic growth stage.
Identifiers: *Euchaeta japonica, Survival, Macroinvertebrates, Culture media, Membrane filtration, Eggs, Sample preparation.

Seawater extracts of marine sediments from two areas were added to copper-enriched seawater in which the prefeeding stages (egg, NI, NII) of Euchaeta japonica (Copepoda:Calanoida) were maintained. Sediment samples were collected with an Ekman and a Shipek sampler. A quantity of the sediment was extracted by allowing the sediment to stand in cold, membrane-filtered seawater. The extract was filtered, stored, diluted to 2 percent, and CuC12 and the prefeeding copepod stages were added. Survival through the prefeeding stages was used as an indication of the effects of the sediment extracts. Survival with the sediment extracts was greater than without, indicating an ability of some part of the extracted material to reduce the toxicity of the copper. The effect of the extracts was compared with that of a synthetic chelating agent to provide an 'equivalent' value. (Holoman-Battelle)
W73-12909

THE EFFECTS OF SUBLETHAL CONCENTRATIONS OF WHOLE BLEACHED KRAFTMILL EFFLUENT ON THE GROWTH AND FOOD CONVERSION EFFICIENCY OF UNDERYEARLING SOCKEYE SALMON (ONCORHYNCHUS NERKA),
Fisheries Research Board of Canada, Nanaimo (British Columbia). Biological Station.
P. W. Webb, and J. R. Brett.
Journal of the Fisheries Research Board of Canada, Vol 29, No 11, p 1555-1563, November 1972. 5 fig, 1 tab, 19 ref, append.

Descriptors: Water pollution effects, *Juvenile fish, *Bioassay, *Animal growth, *Animal metabolism, Growth rates, Lethal limit, Toxicity, Water temperature, Hydrogen ion concentration, Pulp wastes, Dissolved oxygen, Industrial wastes, Laboratory tests, *Bleaching wastes.
Identifiers: Bleached Kraft mill effluent, *Sockeye salmon, Oncorhynchus nerka, Food conversion.

Changes in growth rate and gross conversion efficiency were measured for underyearling sockeye salmon during and after exposure to full bleached kraftmill effluent (BKME). Five groups of fish were exposed for 56 days to 0, 1.0, 2.5, 10, and 15 percent BKME (v/v). Fresh 24-hr composite effluent at pH 6.8 was used daily after filtering. Growth was followed for a further 56 days after BKME exposure. Temperature was held at 15 C and dissolved oxygen between 90 and 100 percent air saturation. Growth rate and conversion efficiency were unaffected at 1.0 and 2.5 percent BKME. Reduced mean growth rate and conversion efficiency at 10 percent BKME were not statistically significant from controls but were considered to be biologically important in estimating threshold response levels. Significant reductions were found at 25 percent BKME. No recovery in retarded growth was found after exposure to BKME. Condition factor and percentage dry weight were not affected. It was concluded from computed response curves that the EC50 of the effluent was approximately 3.7 percent (v/v). (Holoman-Battelle)
W73-12913

A MATHEMATICAL MODEL OF THE NUTRIENT DYNAMICS OF PHYTOPLANKTON IN A NITRATE-LIMITED ENVIRONMENT,
Utah Water Research Lab., Logan.
W. J. Grenney, D. A. Bella, and H. C. Curl Jr.
Biotechnology and Bioengineering, Vol 15, No 2, p 331-358, March 1973. 9 fig, 2 tab, 34 ref.

Descriptors: *Phytoplankton, *Mathematical models, *Nitrates, *Cycling nutrients, *Deficient elements, Computer models, Absorption, Growth rates, Proteins, Nitrogen, Storage, Kinetics.
Identifiers: Monod model, Chemostat.

A three-compartment mathematical model is presented that represents a phytoplankton population capable of storing nitrogen in a nitrate-limiting environment. Growth rates are represented by saturation kinetics based on the concentrations in intracellular nutrient pools. Nutrient flow through a biological system is described using three forms of intracellular nitrogen (inorganic-nitrogen, organic intermediates, and protein). The three-compartment model was developed as part of a larger model to investigate mechanisms associated with nutrient limitation and recycling. The model demonstrated the changes which may occur in the nitrogenous constituents of a phytoplankton population with time and environmental conditions. The model also demonstrates three phenomena which have been observed in field and laboratory experiments but which are not represented by the customary Monod model: (1) uptake rates may significantly exceed net growth rates, (2) high growth rates may be encountered at very low environmental nitrate concentrations, and (3) the ratio of internal nitrogen to population size may change significantly during a study period. It is suggested that the amount of nitrogen in storage may be used as an indicator of the physiological state of a monospecific population. The one-compartment Monod model was shown to be inadequate to accurately represent population growth in chemostat experiments when intracellular storage is a significant factor. (Mortland-Battelle)
W73-12915

BEHAVIOR OF THE GOLDFISH AS AN EARLY WARNING SYSTEM FOR THE PRESENCE OF POLLUTANTS IN WATER,
Polytechnic Inst. of Brooklyn, N.Y. Dept. of Social Sciences.
For primary bibliographic entry see Field 05A.
W73-12916

PHOSPHATE CHEMISTRY IN LAKE SEDIMENTS,
Massey Univ., Palmerston North (New Zealand).
J. K. Syers, R. F. Harris, and D. E. Armstrong.
Journal of Environmental Quality, Vol 2, No 1, p 1-14, January-March 1973. 5 fig, 134 ref.

Descriptors: *Phosphates, *Reviews, *Lake sediments, Sorption, Eutrophication, Solubility, Mineralogy, Algae, Oxidation-reduction potential, Cycling nutrients, Sediment-water interfaces, Iron, Manganese, Calcium, Distillation, Aluminum, Chesapeake Bay, Biomass, Scenedesmus, Calcite, Sinks, Epilimnion, Hypolimnion, Phosphorus, Aquatic soils.
Identifiers: *Nutrient interchange, Desorption, Chemical mobility, Organic phosphorus, Hydroxyapatite, Esters, Linsley Pond, Lake Mendota, Bantam Lake.

The amounts and forms of inorganic and organic phosphate (P) in lake sediments are discussed in relation to sediment composition and properties. The ability of noncalcareous and calcareous sediments to sorb and desorb added P in the laboratory and in the lake environment is interpreted in terms of the amounts and reactivities of sediment components involved in the sorption of P; emphasis is placed on the role of an Fe-rich gel complex. Factors controlling the chemical mobility and biological availability of sediment inorganic and organic P are considered. Whether sediments act as a P source or sink is determined by sediment composition and limnological conditions. The factors involved in the interchange of P between the sediment interstitial water and the overlying water column are reviewed. The role of P in lake eutrophication is discussed briefly. (Mortland-Battelle)
W73-12917

ECOLOGICAL STUDIES OF CODIUM FRAGILE IN NEW ENGLAND, USA,
New Hampshire Univ., Durham. Dept. of Botany; and New Hampshire Univ., Durham. Jackson Estuarine Lab.
R. A. Fralick, and A. C. Mathieson.
Marine Biology, Vol 19, No 2, p 127-132, March 1973. 8 fig, 1 tab, 20 ref.

Descriptors: *Ecology, *Marine algae, *Ecological distribution, *Limiting factors, *Plant physiology, Photosynthesis, Maine, Massachusetts, Surface waters, Plant growth, Standing crops, Reproduction, Water temperature, Light intensity, Salinity, Littoral, Germination, *New England, Primary productivity, Water quality.
Identifiers: *Codium fragile, Seasonal variation, Photosynthetic rates, Assimilation.

Because of the abundance of Codium fragile (Chlorophyta) in New England and its economic importance to scallop and oyster industries, a study was made of the factors responsible for its local growth and distribution. Systematic monthly collections and observations of the algal populations were made with SCUBA equipment in the sublittoral zones at each site in Boothbay Harbor, Maine and in Woods Hole and Wing Neck, Massachusetts. Results of the various growth studies conducted were recorded monthly; hydrographic data were correlated with the growth and reproductive studies. It is suggested that C. fragile is a warm-temperate plant that is growing near its northern limits in New England, but one that has not extended to its potential southern limits. (Holoman-Battelle)
W73-12918

SIMULATION STUDY OF PHYTOPLANKTON PHOTOSYNTHESIS AND GROWTH IN THE FRASER RIVER ESTUARY,
British Columbia Univ., Vancouver. Inst. of Oceanography.
M. Takahashi, K. Fujii, and T. R. Parsons.

Descriptors: *Photosynthesis, *Phytoplankton, Plant growth, *Model studies, Limiting factors, *Primary productivity, *Estuarine environment, On-site investigations, Light intensity, Water temperature, Nitrates, Saline water-freshwater interfaces, Salinity, Phosphorus, Estimating, *Canada, Environmental effects, Water quality, Hydrography, Nutrients, Marine algae, Physicochemical properties, Growth rates.
Identifiers: *Fraser Riverestuary (Canada), Chorophyll a, Photosynthetic rates, Data interpretation.

Phytoplankton photosynthesis was estimated by a simulation model of the Fraser River estuary (Canada). For this estimation, two kinds of information were considered; (1) the photosynthetic response of phytoplankton taken from the estuary to each environmental factor; (2) actual measurement of changes in each environmental factor in the estuary. As the major limiting factors, light, intensity, temperature, and nitrate were taken into account. Variations in these parameters were combined together under the assumption of the 'law of the minimum'; that is, only one of the environmental factors was considered to limit photosynthesis at any given time and place. From the results obtained, it could be shown which environmental factors actually limited phytoplankton photosynthesis in the Fraser River estuary at different times of the year and at different depths. (Holoman-Battelle)
W73-12919

PHYTOPLANKTON ALGAE: NUTRIENT CONCENTRATIONS AND GROWTH,
Woods Hole Oceanographic Institution, Mass.
P. Holmes, M. G. Kelly, G. M. Hornberger, and W. J. O'Brien.
Science, Vol 180, No 4092, p 1298-1300, June 1973. 6 ref.

Descriptors: *Phytoplankton, *Growth rates, *Primary productivity, *Nutrient requirements, *Limiting factors, Plant growth, Biomass, Plant populations, Aquatic environment, Aquatic algae, Aquatic plants, Standing crops, Nutrients.
Identifiers: *Growth kinetics, Substrate concentration.

Critiques of and a rebuttal to an article concerned with nutrients and growth of phytoplankton are presented. Some of the more pertinent points made include: (1) Growth yield depends on the concentration of a limiting nutrient and not necessarily on how fast growth can occur. (2) Considering Monod kinetics, nutrient addition will increase both growth rate and final biomass. Phytoplankton growth kinetics should be considered in terms of both standing crop and productivity, nutrient uptake or growth rate. (3) The Liebig thought of nutrient limitation in terms of enhanced yield and experiments which demonstrate only an enhancement of phytoplankton yield without showing a change in population growth rate are not always valid in determining a real limiting factor in the natural system. (Holoman-Battelle)
W73-12924

DDT IN SOME NEW ZEALAND MARINE AND FRESHWATER FAUNA,
Department of Agriculture, Wellington (New Zealand). Wallaceville Animal Research Center.
For primary bibliographic entry see Field 05A.
W73-12925

CHEMISTRY AND TROPHIC STATUS OF SEVEN NEW ZEALAND LAKES,
Department of Scientific and Industrial Research, Taita (New Zealand). Soil Bureau.
R. H. S. McColl.
New Zealand Journal of Marine and Freshwater Research, Vol 6, No 4, p 399-447, December 1972. 28 fig, 12 tab, 58 ref.

Descriptors: *Tropic level, *Heavy metals, *Water quality, *Nutrients, *Chemical analysis,

Limnology, Water analysis, Dissolved oxygen, Silica, Phosphorus, Nitrogen, Sulfates, Diatoms, Copper, Zinc, Water temperature, Alkalinity, Electrical conductance, Phosphates, Hydrogen ion concentration, Chlorophyll, Dissolved solids, Chlorides, Nitrates, Nitrites, Ammonia, Silicates, Iron, Manganese, Sodium, Calcium Potassium, Magnesium, Sampling, Stratification, Ions, Bicarbonates, Lake morphology, Depth, Land use, Regression analysis, Secchi disks.
Identifiers: *New Zealand lakes, Transparency, Atomic absorption spectrophotometry, Pigments, Staurastrum, Cyclotella, Dinobryon.

The chemistry of the surface and bottom waters of seven Rotorua lakes (Okataina, Rotoma, Tikitapu, Okareka, Rotokakahi, Ngapouri, and Okaro) was examined monthly between April 1970 and April 1971 in relation to the biology of the lakes. Twenty-four parameters were measured, including dissolved oxygen, major ions, silica, phosphorus, nitrogen, algal pigments, and some trace elements. All lakes were warm monomictic, second-class lakes. The waters were soft and variations between lakes in composition of major cations and anions appeared to be related to catchment differences. The major cations and Cl ion varied little with season. Sulfate varied seasonally in the hypolimnia of the most productive lakes (Okaro, Ngapouri, and Rotokakahi). Silica was abundant in all lakes, except Tikitapu where diatoms were poorly represented. Depletion of silica by diatom populations was only observed in the two most productive lakes (Okaro and Ngapouri). All lakes except Ngapouri showed anomalous silica distrubution with lower concentrations in the bottom waters at all times. Copper and zinc varied little between lakes and depths, but showed marked peakes during winter circulation. Data acquired from the analyses were used to classify the lakes by trophic level. Algal growth was most vigourous during winter cirulation and in some lakes a related phosphate 'depletion phase' occurred. Nitrate concentrations were low by world standards, except in the most productive lakes during winter circulation. Nitrite occurred irregularly in the surface waters of some lakes and in trace amounts in the hypolimnia of all lakes in late summer. (Little-Battelle)
W73-12928

INVESTIGATION OF THE ENVIRONMENTAL FACTORS WHICH AFFECT THE ANAEROBIC DECOMPOSITION OF FIBROUS SLUDGE BEDS ON STREAM BOTTOMS,
Lawrence Univ., Appleton, Wis.
For primary bibliographic entry see Field 05B.
W73-12936

BACTERIAL DEGRADATION OF DETERGENT COMPOUNDS,
Missouri Univ., Columbia. Div. of Biological Sciences.
For primary bibliographic entry see Field 05B.
W73-12938

MARICULTURE IN ESTUARINE OIL--PIPELINE CANALS IN LOUISIANA,
Nicholls State Univ., Thibodaux, La. Dept. of Biological Sciences.
A. H. Harris, R. H. Kilgen, and D. Kraemer.
Available from NTIS, Springfield, Va. 22151 as COM-73-10513 - Price $3.00 printed copy; $1.45 microfiche. Louisiana State University Center for Wetland Resources Sea Grant Preprint, 1973. 8 p, 1 fig, 4 ref. (Paper presented to 4th Annual Meeting and Workshop of the World Mariculture Society, January 24-26, 1973, Monterrey, Mexico).

Descriptors: *Fish physiology, *Oily water, *Estuaries, *Louisiana, *Channel catfish, Growth stages, Water quality, Water pollution sources, Oil industry, Evaluation, Water pollution effects, Canals, Pipelines.
Identifiers: Mariculture studies.

The value of the biological productivity of the Louisiana estuaries is probably diminished by the presence of subsurface mineral deposits in the form of gas, oil, and sulphur. A study has been initiated to determine the suitability of utilizing some of the thousands of acres of estuarine oil-pipeline canals in Louisiana for mariculture purposes. Channel catfish, pompano, and white shrimp are selected test animals. Preliminary catfish culture results are reported. Channel catfish stocked in a 2.55 hectare brackish-water oilfield pipeline canal averaged 323 g after 6 months. Growth rates, water quality, and pathogenic organisms have remained within acceptable parameters. Predation, overbank flooding, and harvesting are the most obvious problems. (Woodard-USGS)
W73-12951

STANDING CROPS OF NATURAL FISH POPULATIONS IN BRACKISH-WATER OIL FIELD PIPELINE CANALS,
Nicholls State Univ., Thibodaux, La. Dept. of Biological Sciences.
R. H. Kilgen, A. H. Harris, and D. Kraemer.
Available from NTIS, Springfield, Va. 22151 as COM-73-10512 - Price $3.00 printed copy; $1.45 microfiche. Louisiana State University Center for Wetland Resources Sea Grant Preprint, 1973. 15 p, 1 fig, 4 tab, 11 ref. (Paper presented to 4th Annual Meeting and Workshop of World Mariculture Society, January 24-26, 1973, Monterrey, Mexico).

Descriptors: *Fish physiology, *Oily water, *Estuaries, *Canals, *Louisiana, Pipelines, Water pollution effects, Fish, Growth stages, Fish reproduction, Marshes, Oil industry, Water quality.
Identifiers: *Mariculture studies.

Brackish-water oilfield pipeline canals located in coastal Louisiana were rotenoned so that mariculture studies could be conducted. Standing crops within the canals ranged from 133 to 369 kilograms per hectare, with an average minimum wholesale value of $38.80 per hectare. Centrarchids and channel catfish were found in lower salinity canals (5.5 to 8.5 parts per thousand), but not in a higher salinity canal (25 parts per thousand). Sea catfish, oyster toadfish, and gray snapper were found only in the latter. The canals contained from 15 to 28 different fish species, with clupeids, sparids, and sciaenids predominating. Standing crops within pipeline canals are apparently higher than in surrounding areas, but potential brood stock may never reproduce due to their being trapped within the canals. (Woodard-USGS)
W73-12952

A SYMPOSIUM ON THE PRESERVATION AND MULTIPLE-USE PROBLEMS IN THE GREAT LAKES,
Department of Fisheries and Forestry, Ottawa (Ontario).
P. M. Higgins.
In: Multiple-Use Problems in the Great Lakes; Wisconsin University Sea Grant Report WIS-SG-72-107 (Public Information Report No 7), p 15-22, 1972.

Descriptors: *Water pollution sources, *Water pollution effects, *Great Lakes, *Industrial wastes, *Environmental effects, Effluents, Thermal pollution, Heavy metals, Solid wastes, Ecology, Ecosystems, Aquatic life, Water quality, Recreation facilities, Social aspects, Water pollution control, Pollution abatement, Multiple-purpose projects, Management.

The Great Lakes, the largest interconnected bodies of freshwater in the world, were long thought to have had an infinite capacity for receiving man's pollutants. The Lakes were thought to be a bottomless sink. Recent events in the lower Great Lakes and in Lake Michigan have proven how wrong this concept has been. The Lakes have very distinct capacities for receiving wastes. In the case of Lakes Erie and Ontario, the dangerous loading limits of phosphorus are .03 and .08 g/sq m per yr, respectively. The loading to Lake Erie is already greater than the dangerous level, and the projected loading (1986) for Lake Ontario without appropriate treatment will see Lake Ontario move to a eutrophic condition. Some of the ecological changes which man has wrought in the Great Lakes System are presented and other activities which have potential for further ecological upset are identified. (See also W73-12960) (Woodard-USGS)
W73-12962

MERCURY IN CANADIAN FISH,
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
E. G. Bligh.
Can Inst Food Sci Technol J, Vol 5, No 1, p A6-A14. 1972. Illus.
Identifiers: *Canada, *Fish, Japan, *Mercury, Pollution, Sweden, Industrial wastes.

Japanese and Swedish experiences with Hg pollution are reviewed. Some highlights of the Canadian national survey on Hg contamination are presented including type of fish, location and Hg content. Industrial sources that may be contaminating waters and the incorporation of Hg contaminated fish into animal feeds are considered.--Copyright 1973, Biological Abstracts, Inc.
W73-12970

SIMPLIFICATION OF THE BLUE MOUNTAIN LICHEN COMMUNITIES NEAR A ZINC FACTORY,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
H. N. Thomas, III.
Bryologist. Vol 75, No 3, p 315-324. 1972.
Identifiers: *Water pollution effects, *Lichen, Metal, *Pennsylvania, Simplification, Tolerance, *Zinc factory.

In Lehigh Water Gap (Pennsylvania) near a zinc factory, species diversities of corticolous, saxicolous, lignicolous, and terricolous lichen communities are markedly reduced compared to the species diversities of lichen communities in Delaware Water Gap. Nine lichen species were found in Lehigh Water Gap; 84 in Delaware Water Gap. Foliose, fruticose, crustoe species, respectively, are increasingly more tolerant of the conditions around the Zn factory. The effect of the Zn factory on the Blue Mountain lichen flora is discernible up to 6 km to the west of Lehigh Water Gap and 15 km to the east.--Copyright 1973, Biological Abstracts, Inc.
W73-12973

TRISODIUM NITRILOTRIACETATE IN DRINKING WATER: METABOLIC AND RENAL EFFECTS IN RATS,
North Carolina Univ., Chapel Hill. Dept. of Pathology.
K. R. Mahaffrey, and R. A. Goyer.
Arch Environ Health. Vol 25, No 4, p 271-275. 1972. Illus.
Identifiers: Acetates, Metabolic effects, *Nitrilotriacetate (Trisodium), Rats, Renal effects, *Potable water.

Trisodium nitrilotriacetate (Na-NTA) at either 0.01%, 0.10% or 1% (weight/volume) was given to rats in drinking water with or without 200 micrograms lead (Pb)/ml. At the 1% Na-NTA level, rats became ill and were autopsied after 4 wk of the experiment. These rats had a vacuolar tabular nephropathy, hyperglycemia and a marked glycosuria. Rats given 0.01% and 0.10% Na-NTA with or without Pb displayed no histologic changes in kidney, liver, brain or pancreas but had elevated blood glucose levels. The Na-NTA alone lowered

Pb content of kidneys, whereas Na-NTA with Pb did not enhance Pb deposition in kidney. The hyperglycemic effect of Na-NTA was confirmed in a second strain of rats. The mechanism whereby Na-NTA influenced blood glucose levels is unknown but may relate to trace metal chelation.--Copyright 1973, Biological Abstracts, Inc.
W73-12982

EFFECTS OF STRESS ON PHEASANTS PREVIOUSLY GIVEN POLYCHLORINATED BIPHENYLS,
South Dakota Cooperative Wildlife Research Unit, Brookings.
R. B. Dahlgren, R. L. Linder, and W. L. Tucker.
J Wildl Manage. Vol 36, No 3, p 974-978, 1972.
Identifiers: Phasianus colchicus, *Pheasants, Starvation, Polychlorinated biphenyls, Pesticide residues.

Adult hen pheasants (Phasianus colchicus) that received 16 capsules each containing 50 mg of polychlorinated biphenyls (PCB), Aroclor 1254, once a week, and those given 7 capsules each containing 50 mg of PCB at 3.5-day intervals, were alternately starved for 2 or 3 days and then fed for 2 days. Controls treated similarly lived longer than birds treated with PCB. Brain residues of PCB in treated birds were considerably higher (highest greater than 240 ppm) in birds stressed by starvation when compared with PCB-treated birds that were not starved (highest 24 ppm). Stresses that cause loss of weight can be dangerous to birds having a body burden of PCB.--Copyright 1973, Biological Abstracts, Inc.
W73-12995

THE EFFECTS OF DIESEL FUEL ON A STREAM FAUNA,
California Univ., Berkeley. Museum of Vertebrate Zoology.
R. B. Bury.
Calif Fish Game. Vol 58, No 4, p 291-295, 1972.
Identifiers: *Diesel fuel, *Fauna, Fish, Invertebrates, Petrochemical wastes, Streams, Transportation, *California (Hayfork Creek).

The spillage of approximately 2000 gallons of diesel fuel into Hayfork Creek, California, resulted in a large kill of invertebrates, fishes and other life. Subsequent effects on the stream fauna are discussed. This study examines the increasing threat of pollution in remote areas due to the transportation of petrochemicals.--Copyright 1973, Biological Abstracts, Inc.
W73-12997

SOURCES OF CO2 FOR NUISANCE BLOOMS OF ALGAE,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
C. E. Boyd.
Weed Sci. Vol 20, No 5, p 492-497, 1972. Illus.
Identifiers: *Algae, Ankistrodesmus-falcatus, *Bacteria, Carbon, Chlamydomonas, Chlorella-pyrenoidosa, Coelastrum-microporum, Eutrophication, *Nuisance blooms, Oxides, Scenedesmus-dimorphus, Scenedesmus-quadricauda, Staurastrum-sp.

Bacterial production of CO2 from sucrose substrate increased growth of 7 spp. of algae (Ankistrodesmus falcatus (Corda) Ralfs, Chlamydomonas sp. Chlorella pyrenoidosa Chick, Coelastrum microporum Naegeli, Sc ıedesmus dimorphus Kutz, S. quadricauda (turp.) Breb, and Staurastrum sp.) in CO2-linked laboratory cultures. Decomposition of organic matter in pond water also supplied enough CO2 to support good algal growth in cultures deprived of other sources of CO2. Estimates of CO2 production from decay of dissolved organic matter in 6 pond waters ranged from 0.32 to 3.53 mg/L per 24 hr. The carbonate-bicarbonate equilibrium system is a major source of CO2 for algal photosynthesis. However, in waters of low or extremely high alkalinity, this system will not support high rates of photosynthesis. In such waters CO2 from decomposition will stimulate photosynthesis. Decomposable organic compounds must be considered with N and P as factors responsible for accelerated eutrophication and nuisance algal blooms.--Copyright 1973, Biological Abstracts, Inc.
W73-13000

5D. Waste Treatment Processes

SUMMARY REPORT: COMPREHENSIVE SEWERAGE STUDY FOR SCHENECTADY COUNTY, NEW YORK.
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
For primary bibliographic entry see Field 05G.
W73-12359

TOWN OF CAIRO WASTE WATER REPORT.
Diachishn (A.) and Associates, New York.

Available from the National Technical Information Service as PB-214 027, $3.00 in paper copy, $1.45 in microfiche. Prepared for Greene County Planning Department, Cairo, New York. August 1972. 18 p, 3 fig, 3 tab. N.Y.P. 246.

Descriptors: *Planning, *Sewerage, *Waste water treatment, Projections, Costs, Federal grants, *New York, Treatment facilities, City planning.
Identifiers: *Cairo (New York).

A planning prospectus is presented for the possible construction of a wastewater disposal system for the small town of Cairo, New York (year round population approximately 800) and 3 nearby hamlets which have adequate public water supplies but no sanitary sewerage. A previous study for comprehensive sewerage is reviewed, population growth to 2020 is forecast, possible wastewater treatment facilities are outlined, and a sanitary sewer district to encompass the hamlets of Cairo, including South Cairo, Purling and Acra, is proposed. Costs are also estimated and it is concluded that construction of the facilities is not likely without federal and state grants. (Elfers - North Carolina)
W73-12366

REGIONAL UTILITIES STUDY: SEWERAGE VOLUME OF TECHNICAL APPENDIX.
Minges (James S.) and Associates, Inc., Farmington, Conn.

Prepared for Capitol Region Planning Agency, Hartford, Conn., 1969. 134 p, 13 fig, 30 tab, 40 ref, glossary. UPA: CONN P-78 (G).

Descriptors: *Sewerage, *Waste water treatment, Land use, Projections, Treatment facilities, Planning, *Connecticut, Regional analysis, Regional development.
Identifiers: Service areas, Hartford (Conn), Sewage loads, Treatment plant capacity.

Detailed background data related to sewerage are presented. Planning procedures involved in formulating the final sewerage plans presented in the Regional Utilities Study are illustrated. The data and planning information fall under several categories: (1) background data on population and land use plus planning concepts; (2) sewerage inventory data on existing systems and treatment plants, sources of wastewater, service areas, and sewage flows; (3) the future needs for sewerage including estimates of future sewage flows and service areas; and (4) alternative sewerage plan elements such as proposed treatment plant capacities, their receiving streams, and their costs. Most of the data are presented on a town by town basis. (Elfers - North Carolina)
W73-12369

WASTE WATER TREATMENT IN COMMERCIAL FISH PROCESSING: REDUCING STICK WATER LOADINGS,
Wisconsin Univ., Madison.
J. T. Quigley, and D. A. Stuiber.
Available from NTIS, Springfield, Va. 22151 - COM-73-10158 - Price $3.00 printed copy; $1.45 microfiche. Sea Grant Advisory Report No 1, WIS-SG-72-401, November 1972. 17 p, 5 fig, 4 tab, 4 ref.

Descriptors: *Waste water treatment, *Food processing industry, *Water pollution control, *Suspended solids, Lipids, Proteins, Aerobic treatment, Anaerobic bacteria, Waste treatment, Methodology, Industrial wastes, Lake Michigan.
Identifiers: Anaerobic processes, Aerobic processes.

At the request of a commercial fish processor operating on Lake Michigan, Sea Grant Advisory Services personnel investigated a waste water disposal problem. Large volumes of waste water resulting from the processing of alewives for fish meal were being inadequately treated in a lagoon system. Since the partially treated effluent then entered Green Bay, an abatement order had been issued by the State of Wisconsin. The waste water problem was studied in two stages. First, practices were examined to determine whether process revisions could be made to reduce the amount of lipids, protein and other suspended solids in the discharge. While little progress could be made within the constraints of the existing process, a new step was developed to remove more solids and to increase product recovery. Secondly, the resulting waste water discharge was studied to improve treatment practice. Owing to the complexity of the material in the discharge, an anaerobic treatment stage was required. Design was focused on combination anaerobic-aerobic systems. (Woodard-USGS)
W73-12420

A PILOT FISH-POND SYSTEM FOR UTILIZATION OF SEWAGE EFFLUENTS, HUMBOLDT BAY, NORTHERN CALIFORNIA,
California State Univ., Humboldt, Arcata.
G. Allen, G. Conversano, and B. Colwell.
Available from NTIS, Springfield, Va 22151 as COM-73-10333 Price $3.00 printed copy; $1.45 microfiche. Sea Grant Publication HSU-SG-3, September 1972. 25 p, 3 fig, 3 tab, 6 ref.

Descriptors: Fisheries, *Fertilization, *Sewage effluents, Ponds, *Construction costs, *California, Real costs, Structural analysis, Engineering, *Water reuse.
Identifiers: *Fish pond construction.

In October of 1969, the California Wildlife Conservation Board authorized funds to construct two fish ponds to undertake pilot studies of fertilization with sewage effluents to enhance the growth of fish. The city of Arcata granted to California State University, Humboldt, the use of its area for a minimum of ten years for aquaculture purposes. All real costs (estimated at $53,732.00) in the construction of these two ponds are presented, and the engineering and construction problems encountered are described. In addition, ways are suggested to minimize such problems and to reduce the costs for any similar ponds which might be planned in the future either for experimental or production purposes. (Woodard-USGS)
W73-12434

SYSTEM FOR REMOVING COLOR FROM PAPER MILL LIQUID WASTE,
Owens-Illinois, Inc., Toledo, Ohio. (assignee)
H. C. Croom.
U. S. Patent No. 3,736,254, 3 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1669, May 29, 1973.

Descriptors: *Patents, Wood wastes, *Color, Lime, Carbon dioxide, Pulp and paper industry, Treatment, Pollution abatement, Water pollution control, Water quality control, Chemical reactions, Pulp wastes, *Waste water treatment.
Identifiers: Paper mill wastes.

Waste water discharged from a paper mill is passed through the following steps: lime and lime mud additions, mixing, clarification, and carbonation. Clarification takes place under alkaline conditions to effect precipitation of calcium salts and conjoint agglomeration separation of color bodies. The resulting effluent is carbonated with carbon dioxide, promoting further precipitation of calcium salts and conjoint agglomeration of color bodies. (Sinha-OEIS)
W73-12445

WATER DECOLORIZATION,
M. Ghassemi, H. L. Recht, and E. V. Kleber.
U. S. Patent No. 3,736,255, 4p, 7 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1669, May 29, 1973.

Descriptors: *Patents, Pollution abatement, *Industrial wastes, Chemical reactions, *Filtration, Treatment, Color, Pulp and paper industry, *Waste water treatment, Water quality control, Water pollution control, *Tannery wastes.
Identifiers: Lanthanum salts, Rare earths, Textile mills.

A method is provided for chemically removing coloring matter from water by treating the coloring matter-containing water with a trivalent rare earth salt, generally as a mixture of such salts, to form an insoluble rare earth precipitate and then separating the precipitate from the water. The rare earth precipitant salt, such as lanthanum chloride or lanthanum sulfate, may be regenerated by first heating the rare earth precipitate to form rare earth oxides and to drive off the organic components by converting them to carbon dioxide and water. The rare earth oxide may be used directly in acidic waters or converted to a soluble rare earth salt by using acid such as dilute hydrochloric or sulfuric acid. (Sinha-OEIS)
W73-12446

METHOD OF REDUCING PHENOLIC WASTE,
General Electric Co., Pittsfield, Mass. (assignee)
J. H. Thayer, and E. C. Y. Fan.
U. S. Patent No. 3,736,292, 2 p, 2 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1675, May 29, 1973.

Descriptors: *Patents, *Phenols, Resins, *Waste water treatment, Pollution abatement, Water pollution control, Water quality control, Chemical reactions.
Identifiers: Aldehyde.

Phenol content is markedly reduced in waste discharged from apparatus used for producing phenol-aldehyde resins. Aqueous solutions produced by the reaction between the phenol and aldehyde at different stages of the reaction and containing different proportions of phenol are mixed together at a temperature in the range of about 30C. to 45C. This provides rapid separation into two solution layers, of which one contains low phenol concentration and may be discharged as waste, and the other contains high phenol concentration which is returned to the reaction vessel for further use in resin production. The low phenol waste solution thus discharged enables a reduction in pollution of streams into which products of the resin process are usually discharged. (Sinha-OEIS)
W73-12447

PROCESS AND APPARATUS FOR REMOVING MERCURY FROM WASTE WATER,
Sobin Chlor-Alkali, Inc., Orrington, Maine. (assignee)
P. De Angelis, A. R. Morris, and A. L. MacMillan.
U. S. Patent No. 3,736,253, 4 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1669, May 29, 1973.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, Metals, Resins, Coals, *Chelation, *Filtration, Chemical reactions, Pollution abatement, Water pollution control, Water quality control, *Mercury.
Identifiers: Anthracite coal, Chemical treatment.

Mercury laden water can be treated with sodium borohydride to reduce dissolved mercury to the metallic form. The water treated with reducing agent is filtered through a pressure leaf filter coated with a filter aid, contacted with finely divided anthracite coal and then with a chelating resin. Three examples are given. (Sinha-OEIS)
W73-12449

ACTIVATED SLUDGE PLANT,
R. H. Uden.
U.S. Patent No. 3,735,870, 4 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1578, May 29, 1973.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Activated sludge, *Aeration, *Industrial wastes, Pollution abatement, Water quality control, Water pollution control, Treatment facilities.

Connected in series are a septic or digester tank, aeration tanks, a settling tank and a final aeration tank. Sewage enters the digester tank where all heavy grit and large particles remain to decompose and break down to be carried into the next stage, the aeration cycle. Here it meets re-aerated sludge entering from an advanced point in the cycle. The mixture of sewage and sludge then passes along a series of aerating tanks, to a settling tank where the activated sludge is pumped from the bottom to the first aeration tank, the floating scum is pumped into the digester tank, and the purified sewage is passed to a final aeration tank from whence it may be discharged into a body of water or onto the land. (Sinha-OEIS)
W73-12451

FLOTATION MACHINE WITH VERTICALLY RECIPROCATING AERATORS,
A. M. Fedotov, E. S. Alexeev, G. A. Denisov, K. A. Rundkrist, and A. A. Skrunde.
U. S. Patent No. 3,735,868, 5 p, 8 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1578, May 29, 1973.

Descriptors: *Patents, *Aeration, Equipment, *Flotation, *Mineral industry, *Waste water treatment, *Industrial wastes, Pollution abatement, Water quality control, Water pollution control.

A flotation machine incorporating a chamber for pulp and a means for removing separated products, also contains vibration aerators and ducts for the supply of air to piston like portions. There are also openings for the passage of pulp during the upward stroke of the aerators. The piston-like portion of each aerator is provided with flaps of elastic material adapted to close the openings and for the passage of pulp in the course of the aerator downward stroke and open them in the course of the aerator upward stroke. As the result of such an arrangement, the operation of the machine is accompanied with an intensive stirring and aeration of pulp at low values of the vibrational speed of the aerator, owing to which there takes place a considerable reduction of the electric energy consumption and aerator wear. (Sinha-OEIS)
W73-12452

WASTE DISPOSAL ASSEMBLY,
A. G. Borden.
U.S. Patent No. 3,734,852, 4 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 910, No 4, p 1312, May 22, 1973.

Descriptors: *Patents, *Sewage treatment, *Pollution abatement, Equipment, Heat treatment, Bacteria, *Waste treatment, *Water pollution treatment, *Water quality control, *Sanitary engineering, Water pollution control, Waste disposal.

Sewage is subjected to thermal treatment in the first chamber of this assembly. It is held until it attains a temperature at least that of boiling water to reduce the bacterial level to a relatively low tolerable level. A jacket forming the second chamber is provided with a gas inlet and a gas outlet so that hot gas passes through the second chamber heating the first chamber by conduction. (Sinha-OEIS)
W73-12454

WASTEWATER TREATMENT SYSTEM,
Consolidated Foods Corp., Hayward, Calif. Shasta Beverages Div.
F. A. Karr.
U.S. Patent No 3,734,850, 3 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 910, No 4, p 1311, May 22, 1973.

Descriptors: *Patents, *Waste water treatment, *Oxygenation, *Industrial wastes, Pollution abatement, *Aeration, Bacteria, Enzymes, Water quality control, Water pollution control, Bubbles, *Biological treatment, Biochemical oxygen demand.
Identifiers: *Gas bubbles.

A method and apparatus are provided for treating wastewater by the injection of an oxygen-containing gas, such as air or oxygen or mixtures of the same, into the wastewater while controlling the maximum size of the injected gas bubbles to increase the adsorbed oxygen content retained by wastewater. The injection is made under pressure. The injection is through elements at the bottom of a sump or on stream in a recycle line to and from the sump. A bed of perforate balls on the bottom of the sump provides an excellent surface area for bacterial treatment by coated enzymes injected into the system. (Sinha-OEIS)
W73-12455

CIRCULAR FLOTATION SYSTEM,
Petrolite Corp. St. Louis, Mo. (assignee)
W. F. Burns.
U.S. Patent No. 3,733,272, 6 p, 6 fig, 3 ref; Official Gazette of the United State Patent Office, Vol 910, No 3, p 903, May 15, 1973.

Descriptors: *Patents, *Waste water treatment, *Suspended solids, *Flotation, Equipment, Pollution abatement, Water quality control, Water pollution control.
Identifiers: Dissolved air flotation.

A flotation system removes suspended material from a liquid in a circular vessel with a vertical axis. An upright cylindrical inlet chamber resides centrally on the vessel and receives in a mixing zone in its lower portion the liquid containing dissolved flotation gas through a horizontal tangential inlet. Vertical vanes above the mixing zone direct the circulation liquid into a radial and linear flow rising upward in the inlet chamber. An inverted conical cover supported by the vanes provides an unbroken annular nozzle to direct liquid flow from the inlet chamber in a path forming an acute angle with the top of the vessel. Circumferential liquid outlets on the vessel remove the clarified liquid adjacent the sidewall at a certain selected horizon. Accumulated floating deposits and settled solids are removed through the rotary action of a blade which deposits them into a sump. Settled solids are moved by a bottom scraper into the same sump and both are removed. (Sinha-OEIS)
W73-12457

PROCESS OF TREATING AND PURIFYING SEWAGE, PARTICULARLY OF SEWAGE CONTAMINATED WITH DETERGENTS,
K. Marschall.
U.S. Patent No 3,733,268, 2 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 910, No 3, p 902, May 15, 1973.

Descriptors: *Patents, *Waste water treatment, Oil wastes, *Flocculation, *Filtration, *Detergents, Ozone, Treatment, Pollution abatement, Water pollution control, Water quality control, Atmospheric pressure.

Following preliminary treatment for removal of oil, the sewage is introduced into a container which is held under atmospheric pressure. A mixture of ozone and other gases is introduced. The sewage is sucked from the lower portion of the container and is conducted through a recirculation system. The prepurification may comprise not only removal of oil but aeration, filtration and removal of flocculants. (Sinha-OEIS)
W73-12458

WASTE WATER PURIFICATION BY BREAKPOINT CHLORINATION AND CARBON ADSORPTION,
Environmental Protection Agency, Washington, D.C. (assignee)
D. F. Bishop, A. F. Cassel, and T. A. Pressley.
U.S. Patent No 3,733,266, 4 p, 1 fig, 1 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 910, No 3, p 902, May 15, 1973.

Descriptors: *Patents, *Waste water treatment, *Adsorption, *Chlorination, Ammonia, *Carbon, Chemical reactions, Pollution abatement, Water quality control, Water pollution control.
Identifiers: Breakpoint chlorination.

Wastewater having an NH3--N content in the range of 8-30 mg/liter of wastewater is passed into a mixer reactor. Chlorine is added in the amount of 65-300 mg/liter of wastewater to provide a Cl:NH3--N ratio of about 8-10:1. The pH is maintained at a value between 5.8 and 9.5 providing for breakpoint chlorination. The mixture now substantially free of NH3--N, is introduced into a carbon adsorption zone. Ammonia removal by breakpoint chlorination proceeds according to: $3Cl2 + 2NH3$ goes to $N2 + 6HCl$. The breakpoint is defined as the point where the NH3--N is reduced to zero, free available chlorine is detected and the total residual chlorine is minimized. (Sinha-OEIS)
W73-12459

CROSS-FLOW FILTRATION PROCESS FOR REMOVAL OF TOTAL ORGANIC CARBON AND PHOSPHATES FROM AQUEOUS SEWAGE EFFLUENTS,
Atomic Energy Commission, Washington, D.C. (assignee)
K. A. Kraus, and H. A. Mahlman.
U.S. Patent No 3,733,265, 4 p, 3 fig, 5 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 910, No 3, p 902, May 15, 1973.

Descriptors: *Patents, Phosphates, Organic matter, *Nutrient removal, *Filtration, *Waste water treatment, *Liquid wastes, *Sewage treatment, Chemical reactions, Pollution abatement, Water quality control, Water pollution control.
Identifiers: Chemical treatment.

A method is set forth for the removal of organic material and phosphate from liquid sewage. The sewage is mixed with finely divided carbon or graphite and at least one additive from the group consisting of a salt which hydrolyzes to a hydrous oxide, or the hydrous oxide itself. The pH is adjusted to a value no greater than 4. The mixture is then moved tangentially past one face of a porous substrate at a pressure of from 3 to 100 psi to produce a clarified filtrate on the opposite side of the substrate. Six examples are cited. (Sinha-OEIS)
W73-12460

WASTE TREATMENT SYSTEM,
Kimberly-Clark Corp., Neenah, Wis. (assignee)
M. G. Mandt.
U.S. Patent No 3,733,263, 3 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 910, No 3, p 901, May 15, 1973.

Descriptors: *Patents, *Waste water treatment, *Suspended solids, *Aeration, Equipment, Pollution abatement, Water pollution control, Water quality control, Biochemical oxygen demand.

A single unit utilizes low power input. A rotating ejector bank periodically scours the aeration tank bottom. Oxygen-rich gas is introduced within an aeration zone causing the liquid to move circuitously about a baffle. A portion of the sewage passes under the baffle into a central clarifying zone. The solids settle out and the liquid is removed. The solids are removed by the use of the rotating ejector bank or banks. (Sinha-OEIS)
W73-12461

NEUTRALIZATION OF METAL CONTAINING WASTES,
Secretary of the Interior, Washington, D.C. (assignee)
L. C. George, L. N. Ballard, and V. H. Feeler.
U.S. Patent No 3,736,239, 3 p, 2 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1666, May 29, 1973.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, Metals, Pollution abatement, Water quality control, Water pollution control, *Hydrogen ion concentration, Sodium compounds, Chemical reactions, *Filtration, *Neutralization.
Identifiers: *Cyanide, Electroplating industry, Chemical treatment, Sodium hydroxide, Hydrogen cyanide, Metal oxides.

The process comprises the slow addition of an acid, metal-containing liquid waste stream to an alkaline, cyanide and metal-containing liquid waste stream. The order of addition is critical in order to avoid the formation of hydrogen cyanide. It is important that the mixing be done slowly with agitation. The reaction is best carried out in a vessel equipped with stirring or agitation and an alkaline scrubber. Any evolved gas is scrubbed with an alkaline solution, such as sodium hydroxide, as a safety precaution to collect any hydrogen cyanide gas that may evolve. The pH should not be allowed to drop below a value of about 4 to 4.5. The precipitate may be recovered by filtration and further processed for recovery of contained metals, preferably by oxidation to form the corresponding metal oxides. (Sinha-OEIS)
W73-12462

POSSIBILITIES OF WATER TREATMENT BY MEANS OF A MAGNETIC FIELD,
Glowny Instytut Gornictwa, Katowice (Poland).
J. Sablik.
Water Econ, Vol 20, No 7, p 52-67, 1970. 9 fig, 4 tab, 51 ref.

Descriptors: *Water treatment, Sedimentation, Salts, Sewage treatment, Sludge, Water properties, Flocculation, Foreign research, Magnesium compounds, Iron compounds, Coagulation, Calcium compounds, *Waste water treatment, Dissolved oxygen, Bibliographies, Sanitary engineering, *Industrial water.
Identifiers: Poland, Scale-forming compounds, *Magnetic fields, Sediment concentration, Electromagnets.

Because of the great demand in industry and the need to treat industrial water and sewage, water treatment is becoming one of the principal problems in water economy. Much time has been devoted to investigations into the effects of different physicochemical reactions on water environment. Achievements in the treatment of water environment in a magnetic field are presented. The technological aspects, results of the basic investigations, and the hypothesis used in attempting to justify the phenomenon observed are discussed. Consideration should be given to the possibilities of using data from previous investigations to obtain a more thorough knowledge of surface and interphase phenomena in a water environment. (USBR)
W73-12481

WASTEWATER TREATMENT DESIGN RELATED TO BIOLOGICAL GROWTH SUPPORTED BY ACTIVATED CARBON,
Mississippi State Univ., State College. Dept. of Civil Engineering.
E. C. McGriff, Jr.
Available from the National Technical Information Service as PB-222 175, $3.00 in paper copy, $1.45 in microfiche. Mississippi Water Resources Research Institute, Mississippi State Report, July 1973. 46 p, 18 fig, 9 tab, 8 ref. OWRR-A-067-MISS (1).

Descriptors: *Waste water treatment, *Activated carbon, *Oxygen uptake, *Kinetics, Biological treatment, *Oxygen demand, Biological properties, Chemical oxygen demand.

The objective was to evaluate the response of the biological activity at the carbon solid-liquid interface of an expanded bed adsorber. The evaluation of the biological activity was performed by conducting non-flow kinetic studies, continuous flow kinetic studies, and oxygen uptake studies. The research was divided into two phases. Phase I consisted of the non-flow kinetics whereas Phase II consisted of the continuous flow kinetics and the oxygen uptake studies. The results indicate that the response of the biological film supported by granular carbon can be defined by conducting oxygen uptake studies. Biological activity of the attached film was established through the use of an energy-total energy constant. The average constant calculated was 0.50 mgO2 utilized per mg COD removed. This constant can be utilized to predict oxygen demand for the attached film on granular carbon used in expanded bed adsorbers.
W73-12494

PHOSPHORUS REMOVAL AND PLANT OPERATION STUDIES AT FORT WAYNE, INDIANA,
Fort Wayne Water Pollution Control Plant, Ind.
P. L. Brunner, M. Spiegel, and C. F. Niles, Jr.
Available from the National Technical Information Service as PB-222 383, $7.75 in paper copy, $1.45 in microfiche. Environmental Protection Agency report, EPA-R2-73-274, June 1973, 106 p, 15 fig, 52 tab, 16 ref. EPA Project 11060 DXX.

Descriptors: *Nutrient removal, Flotation, Sludge, *Waste water treatment, *Indiana, Phosphorus, Treatment facilities, Water softening, Lime.
Identifiers: *Phosphorus removal, Luxury uptake, *Sludge bulking, *Fort Wayne (Ind).

The demonstration project at the Fort Wayne, Indiana Wastewater Treatment Plant showed that the addition of a portion of the spent lime sludge from the City's water conditioning plant to the influent to the aeration tanks would slightly increase the normal capacity of the activated sludge to remove phosphorus. The same addition, 31,500 to 35,500 pounds per day of spent lime sludge solids, prevented sludge bulking during the warmer months of the year when poor settling sludge is experienced. Duplicate pilot plants were evaluated for the removal of phosphorus by luxury uptake and acid elutriation and as a conventional activated sludge unit. Removals in both units were comparable to those attained in the full scale plant. Higher phosphorus removals were achieved when chemicals (lime, ferric chloride, polyelectrolytes,

pickling acid) were used singly or in combination in the pilot plants. A survey of the flow and characteristics of the sewage in various locations in the City demonstrated that the concentration of total and soluble phosphorus varies with location and, therefore, can to some extent be controlled. Preliminary studies with a tertiary treatment pond receiving treatment plant effluent and storms water overflow indicate that BOD5 and suspended solids concentrations are substantially reduced during passage through the pond. (EPA)
W73-12500

STUDY OF UTILIZATION AND DISPOSAL OF LIME SLUDGES CONTAINING PHOSPHATES,
Monsanto Research Corp., Dayton, Ohio. Dayton Lab.
R. E. Opferkuch, T. Ctvrtnicek, and S. M. Mehta.
Available from the National Technical Information Service as PB-222 354, $8.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency Report No. EPA-R2-73-282, June 1973. 78 p, 23 fig, 27 tab, 26 ref, 8 append. 17070 FBE. 14-12-199.

Descriptors: *Sludge disposal, *Phosphates, *Tertiary treatment, Economics, *Beneficiation, Municipal wastes, Disposal, *Waste water treatment, Fertilizers, Lime, Slaking, Magnesium, Cost comparisons.
Identifiers: Phosphate enrichment, Phosphate industry, *Lime sludges, Thermal beneficiation, Carbonation, Calcining, Transportation costs, Fertilizer value.

Tertiary treatment of municipal sewage with lime effectively removes phosphate but generates considerable quantities of sludge and a sludge disposal problem. Evaluation of technical and economic aspects of potential sludge utilization, or disposal concepts considered agricultural applications, conversion of sludge to products of known market value, and transporting sludge from the plant site by various means. The phosphate industry appeared to offer the greatest potential for utilization of the sludge provided sludge phosphate content could be enriched. Methods considered for phosphate enrichment were: thermal beneficiation, carbonation, and calcining/slaking. While the latter method was the most efficient, process complexity and economics militate against this general approach. In areas where the magnesium content of wastewater is relatively high, sludge processing to recover both phosphate and magnesium could be economical but would require considerable development. Furthermore, process complexity would not suit this approach to treatment plant operations. Preliminary cost estimates are presented for several levels of process complexity in liming secondary effluent with potential recovery of lime and phosphate. A summary of transportation costs, by various means, for removal of sludge from the treatment plant site is also presented. (EPA)
W73-12501

STABILIZATION OF SEWAGE SOLIDS BY THE CHANNEL AERATION PROCESS,
Wisconsin Univ., River Falls.
M. W. Wehking, J. M. Bostrack, L. J. Monette, and L. D. Hansen.
Environmental Protection Agency report, EPA-R2-73-213, June 1973. 90 p, 15 fig, 41 tab, 28 ref, 4 append. EPA Project 17070 DIZ.

Descriptors: *Sludge disposal, *Sludge digestion, *Biological treatment, *Aerobic treatment, Dissolved oxygen, Cost analysis, *Waste water treatment, *Oxidation lagoon, *Aeration.
Identifiers: Oxidation ditch, *Surface aeration, Volatile solids reduction.

The use of an oxidation ditch for treatment of domestic sewage sludges by aerobic digestion was superior to anaerobic digestion. Maximum reductions of 64.7% for volatile solids and 67.8% for COD were achieved. Low temperatures inhibit the process such that below temperatures of 55F neither of these reductions exceeded 45%. At moderate temperatures the DO content of the mixed liquor appears to be the factor limiting COD and volatile solids reductions. When the DO content exceeds 1.5 ppm the reductions of COD and volatile solids reached their maximum values, however, nitrate and phosphate concentrations in the mixed liquor increased to values of 30 ppm and 115 ppm respectively. The dewatering characteristics of the digested sludge were no better than those of raw sludge. Evidence also indicates that this process is better suited to continuous rather than semi-continuous operation. The process also requires close control of operating conditions. Operating costs were $36.50 per ton of solids treated. (EPA)
W73-12502

ELECTRICAL STIMULATION OF MICROBIAL WASTE TREATMENT,
Michigan Univ., Ann Arbor. Dept. of Chemical Engineering.
J. S. Schultz.
Available from the National Technical Information Agency, as PB-222 384, in paper copy $3.50, in microfiche $1.45. Environmental Protection Agency Report No. EPA-R2-73-278, June 1973. p 46, 18 fig, 3 tab. 17050 DGJ.

Descriptors: *Electricity, *Fermentation, Electric fields, Electric currents, Bacteria, Yeast, Growth rates, Waste treatment.
Identifiers: *Stimulation, Membrane transport, Batch culture, Continuous culture.

This project has been directed towards the evaluation of the effect of electrical fields, AC and DC, on the metabolism and growth of micro organisms. Test systems used were batch culture, (aerobic and anaerobic), continuous culture, and the use of genetic mutants for membrane transport studies. Voltages were applied to cell suspensions with inert platinum and carbon electrodes, and were limited to levels below the onset of electrolysis of water. Care was exercised in maintaining constant temperatures for comparative experiments, since on direct effect of applied currents was resistive heating of the solutions. The growth medium was designed so that the carbon source (usually glucose) was the limiting nutrient. For most of the studies, analysis of cell growth and glucose utilization was used to evaluate the effects of electric fields. In batch fermentation experiments some stimulation of growth and sugar utilization was found over a current range of 40 to 120 ma DC, however, the amount of stimulation was within the range of experimental variations. In continuous fermentation, cell growth was not significantly stimulated by electric fields. Electrical fields caused some increase in the accumulation and transport of galactose by E. coli.
W73-12503

DISINFECTION OF SEWAGE EFFLUENTS,
Illinois State Water Survey, Urbana.
F. W. Sollo, Jr., and H. F. Mueller.
Available from the National Technical Information Service as PB-222 355, $6.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency report number, EPA-670/2-73-029, July 1973. 69 p, 37 fig, 7 tab, 35 ref. EPA Project 17060 DNU.

Descriptors: *Disinfection, Halogens, *Chlorine, *Waste water treatment, *Sewage effluents, *Hydrogen ion concentration, Temperature, Coliforms, Bacteria.
Identifiers: *Bromine disinfection.

In view of difficulties encountered with chlorine as a disinfectant under certain conditions, particularly due to ineffectiveness of the chloramines at high pH, bromine is being evaluated as an alternate or supplement to chlorine for disinfection of treated wastewater. Chlorine and bromine are being compared under varying conditions of pH and temperature, using an activated sludge effluent as the test substrate. Both dosage and residuals of chlorine and bromine are being correlated with percent survival of coliforms, fecal coliforms, and total bacterial numbers. Results indicate that in wastes of this type, the effectiveness of chlorine decreases with increasing pH, whereas the effectiveness of bromine increases. Thus it appears possible that bromine may have advantages in wastes of high pH. Combinations of chlorine and bromine are also being evaluated, and it appears that pretreatment with chlorine, followed by bromine, may produce effective disinfection at lower cost than bromine alone. (EPA)
W73-12504

FLUIDIZED BED CLARIFICATION AS APPLIED TO WASTEWATER TREATMENT,
Research Triangle Inst., Durham, N. C.
J. C. Orcutt.
Copy available from GPO Sup Doc as EP1.23/2-72-032, $1.50; microfiche from NTIS as PB-216 604, $1.45 in microfiche. Environmental Protection Agency, Technology Series Report EPA-R2-72-032, December 1972. 98 p, 21 fig, 10 tab, 21 ref. EPA Project 17030 EYA. Contract 14-12-912.

Descriptors: *Waste water treatment, *Coagulation, *Solids contact processes, Sludge treatment, *Separation techniques, *Mathematical models, Silica.
Identifiers: *Sludge blanket, Aluminum sulfate, Ferric sulfate, Activated silica.

An experimental study of the application of a fluidized sludge blanket clarifier to the coagulation and separation of wastewater solids has been made to determine the effects of controlled process variables on the treatment achieved. Experiments using alum and ferric chloride coagulants were carried out in 12- and 24-inch diameter columns by systematic variation of wastewater pH, coagulant dose, upflow fluid velocity, and blanket depth. The results were analyzed using regression analysis techniques, and empirical relationships were derived relating the variables to the removal of suspended solids, total organic carbon, phosphorus, and coagulant metal ions. The sludge production rate was also correlated empirically with the operating variables. A study of the settling rates of discharged sludge and the fluidized blanket was made by direct observation. (Kreissl-EPA)
W73-12505

TERTIARY TREATMENT OF COMBINED DOMESTIC AND INDUSTRIAL WASTES,
Cornell, Howland, Hayes and Merryfield, Corvallis, Oreg.
J. W. Lee, Jr.
Copy available from GPO Sup Doc as EP1.23/2 73 236, $2.60; microfiche from NTIS as PB-222 251, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-236, May 1973. 203 p, 67 fig, 14 tab, 38 ref. EPA Project 11060 DLF.

Descriptors: *Waste water treatment, *Aerobic treatment, *Tertiary treatment, *Industrial wastes, Activated sludge, *Domestic wastes, Flocculation, Filtration, Chemical precipitation, Phosphates, Treatment facilities, *Oregon, Biochemical oxygen demand.
Identifiers: Pet food processing wastes, Mixed media filter, Tube clarifier, Alum, BODS, Polyelectrolyte, Treatment costs, Phosphate removal, Combined treatment, *Tualatin (Ore).

Operation of a secondary-tertiary treatment facility for combined domestic and pet food manufacturing industrial wastewaters at the City of

Tualatin, Oregon, was studied for 16 months. The study demonstrated the feasibility of automated tertiary treatment for small communities treating a combined domestic and industrial wastewater at a reasonable cost. The system was designed for an average daily flow of 280,000 gpd and a BOD5 load of 630 pounds per day. The extended aeration activated sludge process with a design detention time of 24 hours was employed for secondary treatment. An experimental 60 degree inclined tube settler located in the aeration-surge basin provided secondary effluent clarification. The tertiary system consisted of a four step process: (1) alum and polyelectrolyte coagulation, (2) flocculation, (3) inclined tube sedimentation, and (4) mixed media filtration. The tertiary system demonstrated the capability to produce an effluent quality of less than 10 mg/l BOD5 and 5 mg/l suspended solids with a total phosphate residual of 0.1 to 1.0 mg/l (as P). The total capital cost of the facility was $245,800. Based on total annual cost, the cost of treatment at the design conditions was $0.42 per 1000 gallons processed and $0.19 per pound of BOD5 removed. (EPA)
W73-12512

IDENTIFICATION AND CONTROL OF PETROCHEMICAL POLLUTANTS INHIBITORY TO ANAEROBIC PROCESSES,
Union Carbide Corp., South Charleston, W. Va. Chemicals and Plastics.
J. C. Hovious, G. T. Waggy, and R. A. Conway.
Copy available from GPO Sup Doc as EP1.23/2 73-194; $1.25; microfiche from NTIS as PB-222 287, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-194, April 1973. 103 p, 37 fig, 18 tab, 21 ref. EPA Project 12020-FER.

Descriptors: *Chemical wastes, *Industrial wastes, *Anaerobic treatment, Anaerobic digestion, Methane bacteria, Filtration, *Waste water treatment, Filters, Organic wastes, Phenols.
Identifiers: Inhibition, Acrylates, *Crotonaldehyde.

Identification studies were made on potentially inhibitory materials using an unacclimated anaerobic biomass. Identified inhibitory materials and concentrations in mg/l for a 50 percent decrease in activity were acrolein (20-50), formaldehyde (50-100) crotonaldehyde (50-100), 2-ethyl-1-hexanol (500-1000 mg/l), methyl isobutyl ketone (100-300), diethylamine (300-1000 mg/l), acrylonitrile (100 mg/l), 2-methyl-5-ethylpyridine (100), ethylene dichloride (150-500), ethyl acrylate (300-600), and phenol (300-1000). Inhibitory effects were more severe at high volatile acid concentrations. Acclimated cultures were developed in mixed digesters for crotonaldehyde, phenol, and to some degree to ethyl acrylate. No acclimation was observed for sodium acrylate. An anaerobic filter was acclimated to 600 mg/l crotonaldehyde as compared to the 50-100 mg/l unacclimated inhibitory level. Treatment of formaldehyde, ethyl acrylate, phenol, and acrylonitrile indicated synergestic inhibition. Anaerobic filter studies also indicated that crotonaldehyde inhibition could be avoided in a chemical manufacturing waste by dilution, successful treatment of 'hard' surfactant containing wastes also was noted. (EPA)
W73-12513

DEMOSTRATION OF A WASTE DISPOSAL SYSTEM FOR LIVESTOCK WASTE,
Moore Engineering, Inc., West Fargo, N. Dak.
C. R. Moore.
Copy available from GPO Sup Doc as EP1.23/2, 73-245, $0.85; microfiche from NTIS as PB-222 253, $1.45. Environmental Protection Agency, Technology Seires Report, EPA-R2-73-245, May 1973. 50 p, 7 tab, 10 fig, 12 ref. EPA Project 13040 FTX.

Descriptors: *Cattle, Hogs, Sheep, Waste treatment, *Settling basins, Nitrates, Groundwater, Biochemical oxygen demand, Chemical oxygen demand, *Farm wastes, Feed lots, Solid wastes, Dissolved oxygen, *Waste water treatment.
Identifiers: *Stockyards, *Hydrasieve, Sheyenne River, Truck washrack, Solids separation.

Laboratory studies of livestock waste were conducted both before and after the construction of an enlarged settling basin, a hydrasieve at the truck washrack and a two cell waste stabilization pond. A determination of the effectiveness of these two systems and the application of them to feedlots and other livestock facilities in the area were the main objectives. The settling basin and hydrasieve were effective in removing solids and COD from the truck washrack waste. Reductions in COD, total, suspended, and settleable solids were 23.9, 14.8, 50 and 80 percent, respectively. DO increased 42.8 percent and total solids decreased 3 percent across the hydrasieve. This 3 percent consisted of straw and other floating debris which would not be removed at the stabilization pond. The effectiveness of the stabilization ponds was generally good. The BOD5 of the final effluent was reduced 48.6 percent over that of the drainpipe which had drained directly into the Sheyenne River during previous years. (Kreis-EPA)
W73-12517

METHODS FOR PULP AND PAPER MILL SLUDGE UTILIZATION AND DISPOSAL,
Crown Zellerbach Corp. Camas, Wash. Environmental Services Div.
For primary bibliographic entry see Field 05E.
W73-12519

THE SHAGAWA LAKE PROJECT: LAKE RESTORATION BY NUTRIENT REMOVAL FROM WASTEWATER EFFLUENT,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
K. W. Malueg, R. M. Brice, D. W. Schults, and D. P. Larson.
Copy available from GPO Sup Doc as EP1.23: 73-026, $0.85; microfiche from NTIS as PB-222 255, $1.45. Environmental Protection Agency, Ecological Series Report, EPA-R3-73-026, January 1973. 49 p, 13 fig, 1 tab, 4 ref. PA Program Element 1B1031.

Descriptors: *Eutrophication, *Lakes, *Tertiary treatment, *Algal control, *Phosphorus, Nutrients, Municipal wastes, Mathematical models, Limnology, *Minnesota, *Nutrient removal, *Waste water treatment.
Identifiers: *Shagawa Lake (Minn), *Lake restoration, Algal assay, Nutrient budget.

The U.S. Environmental Protection Agency (EPA) has initiated a research project at Ely, Minnesota, to demonstrate the restoration of eutrophic Shagawa Lake by nutrient removal (primarily phosphorus) from municipal wastewater effluent while permitting such treated effluent to continue to flow into the lake. Studies utilizing an advanced wastewater treatment pilot plant showed that phosphorus could readily be removed and the treated effluent did not promote algal blooms in the receiving waters. The National Eutrophication Research Program (NERP) of EPA began operating and evaluating a full-scale advanced wastewater treatment plant in early 1973. Nutrient removal in the plant is primarily by chemical precipitation with lime and is designed to give a final effluent of 0.05 mg/l total phosphorus or less. NERP will evaluate the extent and rate of recovery of Shagawa Lake until at least 1976. Lake data for this period will be compared to that obtained during the six years prior to advanced wastewater treatment. (EPA)
W73-12520

RECONDITION AND REUSE OF ORGANICALLY CONTAMINATED WASTE SODIUM CHLORIDE BRINES,
Dow Chemical Co., Midland, Mich. Environmental Research Lab.
R. D. Fox, R. T. Keller, and C. J. Pinamont.
Copy available from GPO Sup Doc as EP1.23/2:73-200, $2.10; microfiche from NTIS as PB-222 256, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-200, May 1973. 110 p, 39 fig, 8 tab, 8 ref. EPA Project 12020-EAS.

Descriptors: *Brine disposal, *Wastewater treatment, Adsorption, Activated carbon, Industrial wastes, *Phenols, Operating costs, Water reuse, *Mathematical models, *Sodium chloride.
Identifiers: *Acetic acid, *Brine reuse, Waste recovery, Organics.

A plant of 100 gal/min capacity was constructed and operated for one year to demonstrate the feasibility to remove and recover phenol and acetic acid from an 18% sodium chloride brine by adsorption on fixed beds of activated carbon. The purified brine was used for production of chlorine and caustic soda. Separate electrolytical test-cell evaluation of the purified brine showed it to be equivalent to pure brine. Regeneration of the carbon was accomplished by desorption with dilute sodium hydroxide. The phenol desorbed was recycled to the phenol manufacturing plant while the acetate regenerant was processed to underground disposal wells. More than 23 million gallons of brine were purified. Fourteen cycles of phenol adsorption and regeneration and 105 cycles of acetic acid adsorption and regeneration were completed with no significant deterioration of carbon performance. Phenol removal to <1 ppm was accomplished at 50-140 gal/min and 15-70C with an effective carbon capacity of 0.167 lb/lb. Optimum regeneration was with 4% NaOH at 55-70C. Removal of 90% of the acetic acid from brine requires <80 gal/min flow rate and <40C temperature, the resultant loading is 0.04 - 0.06 lb/lb of carbon. The projected net cost of purifying this waste brine for reuse was $1.32 per 1000 gallons. (EPA)
W73-12521

ION EXCHANGE COLOR AND MINERAL REMOVAL FROM KRAFT BLEACH WASTES,
Montana State Univ., Bozeman. Dept. of Civil Engineering.
R. L. Sanks.
Copy available from GPO Sup Doc as EP1.23/2:73-255, $2.35; microfiche from NTIS as PB-222 257, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-255, May 1973. 189 p, 91 fig, 35 tab, 63 ref. EPA Project 12040 DBD.

Descriptors: *Bleaching wastes, *Waste water treatment, Pulp and paper industry, Effluents, Resins, Lime, Water reuse, Costs, Color, *Ion exchange, *Desalination, *Demineralization, Pulp wastes, Industrial wastes.
Identifiers: Bleach plant wastes, *Color removal.

Laboratory evaluations of twenty resins and seven carbons for removing color and minerals from a four-stage kraft bleach plant showed resins were equal to carbon for decoloring the combined waste. With few exceptions, resins were unsuited for decoloring wastes from each stage separately. Except for success in the use of weak wash to regenerate Amberlite XAD-8 resin, utilization of mill liquors for regeneration was unsuccessful. Sulfuric acid, caustic, and ammonia were good regenerants, but lime was poor. Single stage ion exchange produced water adequate for unbleached pulping. Two-stage desalination produced water adequate for bleached pulping. Any of the continuous counter-current ion exchange processes are probably adequate for producing water for bleached pulping. The estimated cost for desalination including amortization over a 10 year period at 9 percent interest, labor,

chemicals, maintenance, and repairs are estimated to vary from $1.38/1000 gal (for the non-optimized process used in the laboratory) to $0.42/1000 gal (with estimated 90 percent cation regeneration efficiency, 85 percent anion regeneration efficiency, and 87 percent product recovery). (EPA)
W73-12522

METHODS FOR THE FURTHER IMPROVEMENT OF SPENT LIQUOR RECOVERY IN LENZING,
Lenzinger Zellulose- und Papierfabrik A.G. (Austria).
H. Danninger.
Trans. available from Institute of Paper Chemistry Appleton, Wisconsin 54911. Price: $5.00. Typescript Translation of Wochenblatt fur Papierfabrikation, Vol 98, No 18, p 725-727, September 30, 1971. 4 fig.

Descriptors: *Pulp wastes, Water pollution control, *Waste dilution, *Filtration, Pulp and paper industry, Diffusion, Foreign countries, Europe, Effluents, Discharge (Water), Sulfite liquors, Magnesium compounds, Calcium compounds, Filters, Industrial wastes, Efficiencies, *Waste water treatment.
Identifiers: *Sulfite pulping, *Austria, Chemical recovery, Magnesium base liquors, Washing, Pulp washing, Spent sulfite liquors, Spent liquors, Sulfite mills.

The Austrian sulfite pulp and paper mill, Lenzinger Zellulose- und Papierfabrik AG., uses the magnesium-base sulfite process which lends itself more readily to recovery of the spent cooking liquor than does the conventional calcium-base process. As much as 95 percent of the spent sulfite liquor is removed from the digested pulp by a four-stage diffusion washing process which minimizes dilution of the waste liquor. The installation of a new filter line is planned in order to increase the recovery efficiency above 95 per cent and proportionally reduce the amount of effluent discharged into receiving waters. (Speckhard-IPC)
W73-12524

JOINT TREATMENT OF PULP MILL EFFLUENTS AND MUNICIPAL SEWAGE.

Paper Trade Journal, Vol 156, No 18, p 30, May 1, 1972.

Descriptors: *Pulp wastes, *Waste water treatment, *Sewage treatment, Municipal wastes, Biological treatment, Effluents, Pulp and paper industry, Activated sludge, Chlorination, Treatment, Biodegradation, Operating costs, Capital costs, Sulfur bacteria, Feasibility studies, Sewage districts, *Wisconsin, Chlorine, Economic feasibility, Costs, Bacteria, Recycling, Nutrients, Nitrogen compounds, Phosphorus compounds, Solids contact processes, Research and development, Mixing.
Identifiers: Spent liquors, *Green Bay (Wis), *Combined treatment.

The major findings of a feasibility study are reported, in which the sewage from the Green Bay, Wisconsin, Metropolitan Sewerage District was treated jointly with effluents from four local paper mills, using four variations of the activated sludge process. Among these variants, the contact stabilization process proved to be the most successful. The growth of filamentous sulfide-utilizing bacteria in the mixed waste liquors was controlled by continuous dosing of the recycled activated sludge with chlorine. For satisfactory operation of the biological oxidation process, nitrogen and phosphorus compounds had to be added as supplementary nutrients. Capital and operating costs for a full-scale installation are indicated. Recommendations for further research are also listed. (Witt-IPC)
W73-12528

DETOXIFICATION OF KRAFT PULP MILL EFFLUENT BY AN AERATED LAGOON,
International Pacific Salmon Fisheries Commission, New Westminister (British Columbia).
J. A. Servizi, and R. W. Gordon.
Progress Report, No 26, 1972. 26 p. 3 fig, 8 tab, 7 ref.

Descriptors: *Pulp wastes, *Treatment facilities, *Aerated lagoons, *Toxicity, Waste waters (Pollution), Operation and maintenance, Pollution abatement, Industrial wastes, *Waste water treatment, Biodegradation, Water quality control, Water pollution control, *Canada, Pulp and paper industry, Douglas fir trees, Softwood, Coniferous trees, Pollutants.
Identifiers: *Kraft mills, *Malfunction, *Black liquors, *Pulpwood, Green wood, Spruce, Spent liquors.

The occasionally substandard detoxification of kraft pulp mill effluents during their treatment in an aerated lagoon at Kamloops Pulp and Paper Co. Ltd. (recently acquired by Weyerhaeuser Canada Ltd.) prompted an eight-month study during a period of inplant changes for pollution abatement. Compared with a laboratory treatment unit, the aerated lagoon responded similarly to kraft mill effluents. Spills of black liquor (spent alkaline pulping liquor) were responsible for some, but not for all occasions of substandard detoxification. Other causes of residual toxic matter resistant to biooxidation were associated with the pulping of green Douglas-fir and sprucewood chips. (Brown-IPC)
W73-12529

START-UP OF BIOLOGICAL TREATMENT FACILITIES FOR PULP AND PAPER MILL WASTES,
H. A. McLean, and K. L. Murphy.
Pulp and Paper Magazine of Canada, Vol 73, No 7, p 89-92 (p T189-192), July 1972. 7 fig, 9 ref.

Descriptors: *Biological treatment, *Pulp wastes, *Treatment facilities, Lagoons, *Waste water treatment, Monitoring, Operation and maintenance, Measurement, Biochemical oxygen demand, Dissolved oxygen, Hydrogen ion concentration, Nutrients, Oxygen demand.
Identifiers: Process variables.

The startup of two biological effluent treatment installations having five-day retention times is described. Requirements for seeding and nutrient additions were studied in the laboratory and verified in the full-scale installations. The biological activity in the lagoon was monitored by measuring the rate of oxygen uptake. This measurement was related to five-day BOD and dissolved oxygen along the lagoon profile. Reductions and variations in pH with biological treatment are illustrated. Recommendations are made for those aspects deserving special consideration during startup. (Brown-IPC)
W73-12531

NEW TRENDS IN WASTE WATER TREATMENT AND RECYCLE,
Bechtel Corp., San Francisco, Calif.
G. A. Sawyer.
Chemical Engineering, Vol 79, No 16, p 120-128, July 24, 1972. 6 fig, 3 tab.

Descriptors: *Reviews, *Waste water treatment, *Water reuse, *Recycling, Municipal wastes, Sewage treatment, Costs, Industrial wastes, Sludge treatment, Technology, Chemcontrol.

The status of waste water treatment technology is reviewed. Various chemical treatment methods and water recycling schemes are evaluated. Both in-plant recycling systems for various industries and municipal waste water reclamation systems for industrial and general use are covered. Advantages and problems of various regional waste water treatment programs are analyzed, including schemes in which municipal sewage is treated jointly with industrial effluents. Cost data for various treatment processes are indicated. Industrial users of reclaimed municipal waste waters are listed. (Witt-IPC)
W73-12533

SELECTING WASTE WATER AERATION EQUIPMENT,
Keene Corp., Aurora, Ill. Water Pollution Control Div.
R. J. Nogaj.
Chemical Engineering, Vol 79, No 8, p 95-102, April 17, 1972. 5 fig, 3 tab.

Descriptors: *Aeration, *Treatment facilities, Waste water treatment, *Activated sludge, *Aerated lagoons, *Equipment, Pollution abatement, Water quality, Surface waters, Lagoons.
Identifiers: *Aeration.

Aerators commonly used in aeration lagoons and in activated sludge processes for waste water treatment are reviewed. Characteristics and operating parameters of different aerators are discussed. Guidelines are presented for selecting the correct type of aerator for specific applications. Equations are given for calculating the number of dimensions of aerators needed, as well as the size and shape of treatment tanks. (Witt-IPC)
W73-12534

THE TTC TEST FOR THE CONTROL OF EFFLUENT PURIFICATION (TEST TTC - NARZEDZIEM KONTROLI PROCESU OCZYSZCZANIA),
K. Lelonkiewicz.
Przeglad Papierniczy, Vol 28, No 4, p 129, April 1972. 2 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, *Monitoring, *Bioassay, Pulp and paper industry, Effluents, Colorimetry, Testing procedures, Enzymes, Biological treatment, Analytical techniques, Sludge digestion, Oxygen demand, Biochemical oxygen demand, Chemical oxygen demand, Recycling, Foreign research.
Identifiers: Kraft mills, Sulfite mills, Dehydrogenases, Triphenyltetrazolium chloride.

In monitoring the purification of pulp mill effluents by the activated sludge process, the use of 2,3,5-triphenyltetrazolium chloride (TTC) offers a simple, albeit controversial, test method for ascertaining the activity of dehydrogenases. The procedure involves incubating a sludge sample in the dark with TTC, followed by ethanolic extraction of the red triphenylformazan formed. This reduced compound, which serves as an indicator of biooxidation, is then determined colorimetrically. A modified version of the TTC test was applied to activated sludge samples used in treating effluents from sulfite- and sulfate-process pulp mills. The results were compared with those obtained by determinations of chemical and biochemical oxygen demands, oxygen indexes, and other standard analytical procedures. Under steady operating conditions, the dehydrogenase activity remained constant. The enzyme activity was sensitive to changes in pollution load and to disturbances in recycling and in aeration. Instances in which increased loads caused no corresponding increase in enzyme activity were correlated with failure of the process to increase in purification efficiency. (Stapinski-IPC)
W73-12535

EFFLUENT TREATMENT IN PAPER AND BOARD MILLS.

International Paper Board Industry, Vol 15, No 1, p 27-28, 30, January 1972.

Descriptors: *Waste water treatment, *Pulp and paper industry, *Reviews, Effluents, Recycling, Waste treatment, Biochemical oxygen demand, Biological treatment, Suspended solids, Solids contact processes, *Pulp wastes, Industrial wastes, Waste treatment, Treatment, Water pollution, Water pollution treatment, Water reuse, Mixing.
Identifiers: *White water, Board mills, Paper mills, Paper machines.

Methods of treating aqueous effluents from paper and board mills are reviewed, including recycling of paper machine waste waters (white waters), primary treatment to remove suspended solids, secondary or biological treatments to reduce biochemical oxygen demand, premixing of wastes, and treatment of condensates. (Witt-IPC)
W73-12537

WASTE TREATMENT PLANT AT ITT RAYONIER INC. MILL, FERNANDINA BEACH, FLORIDA.

Southern Pulp and Paper Manufacturer, Vol 35, No 7, p 36, 38, 40, July 10, 1972. 3 fig.

Descriptors: *Pulp wastes, *Waste water treatment, *Sulfite liquors, Pulp and paper industry, Florida, Effluents, Water pollution control, Industrial wastes, Bleaching wastes, Pollution abatement, Evaporation, Incineration, Recycling, Water reuse.
Identifiers: *Raycycle process, *Sulfite mills, Sulfite pulping, Bleach plants, Chemical recovery.

A schematic description is given of the 'Raycycle' process for treating aqueous wastes of a sulfite dissolving pulp mill. The new process combines spent pulping liquors with effluents from the bleach plant's hot caustic extraction stage for subsequent joint evaporation, combustion, and chemical recovery to reduce the pollution load of the treated effluent. (Witt-IPC)
W73-12541

RAYONIER MAKES MAJOR BREAKTHROUGH IN SULFITE POLLUTION CONTROL.

Paper Trade Journal, Vol 156, No 20, p 50-51, May 15, 1972. 2 fig.

Descriptors: Pollution abatement, Pulp and paper industry, Water pollution treatment, Evaporation, Effluents, *Pulp wastes, Bleaching wastes, Incineration, Sulfite liquors, *Treatment facilities, Chemcontrol, Water pollution, *Florida, Waste water treatment.
Identifiers: *Sulfite pulping, *Chemical recovery, Spent sulfite liquors, Alkaline extraction, Bleaching, Combustion, Spent liquors, Sulfite mills, Raycycle process.

ITT Rayonier Inc. has developed a new pollution control process called 'Raycycle', as part of a program to control water pollution at its Fernandina Beach sulfite pulp mill near Jacksonville, Florida. In this process, the spent sulfite pulping liquor is combined with the effluent from the alkaline extraction stage of the pulp bleaching sequence, and the joint waste waters are evaporated, burned, and subjected to a chemical recovery and regneration process. (Witt-IPC)
W73-12542

INVESTIGATIONS ON WASTE WATER CLARIFICATION WITH ACTIVATED CARBON (UNTERSUCHUNGEN ZUR RESTABWASSER-KLARUNG MIT AKTIVKOHLE),
Technische Universitaet, Darmstadt (West Germany). Wasser- and Abwasserforschungsstelle.
H-L. Dalpke.
Das Papier, Vol 26, No 1, p 4-10, January, 1972. 10 fig, 2 ref.

Descriptors: *Waste water treatment, *Pulp wastes, *Activated carbon, Adsorption, Effluents, Pulp and paper industry, Foreign research, Europe, Effluents, Water pollution treatment, Waste treatment, Industrial wastes, Waste waters (Pollution), Pollution abatement, Water pollution control, Color, Organic matter, Pollutants, Biochemical oxygen demand, Physical control, Chemcontrol.
Identifiers: *Cellulose, Cellulose fibers, *Germany.

The removal of biologically harmful substances, characterized by their consumption of oxygen, from pulp and paper mill effluents is essential to the preservation or restoration of waterways. In addition to biological purification methods, several chemical and physical processes for reducing the five-day biochemical oxygen demand of industrial effluents have been suggested. Adsorption of pollutants on activated carbon is one of the more promising methods. This process has been investigated in several laboratory experiments in which mill effluents were subjected to the action of activated carbon contained in four sequential cylindrical vessels. Under the experimental conditions used, effluents could be completely decolored at specific flow rates of 1.5 liters per hr per kg of activated carbon. In addition, this treatment completely eliminated residual papermaking fibers and reduced the average five-day biochemical oxygen demand to 25 mg of oxygen per liter, or less. The technique and the apparatus used are described and illustrated. Their theoretical operating principle is also explained, notably various kinds of adsorption mechanisms. (Wise-IPC)
W73-12543

PRACTICAL DECOLORIZATION OF KRAFT MILL EFFLUENTS (PRAKTYKA USUWANIA BARWY SCIEKOW POSIARCZANOWYCH),
Instytut Celulozowo-Papierniczy, Warsaw (Poland).
C. Leszczynski.
Przeglad Papierniczy, Vol 28, No 3, p 88-89, March, 1972. 1 fig, 13 ref.

Descriptors: *Pulp wastes, *Color, *Lime, *Waste water treatment, Pulp and paper industry, Effluents, Chemical precipitation, Recycling, Pollution control treatment, Water quality control, Sedimentation, Bleaching wastes, Dewatering, Calcium carbonate, Calcium compounds, United States, Reviews.
Identifiers: *Kraft mills, Decoloration, Lignin, Tannins, Bleach plants, Chemical recovery, Causticizing.

Waste waters discharged by sulfate-process (kraft) pulp and paper mills contain color bodies comprising mainly lignin derivatives and tannins. In the concentrations currently encountered in natural waters, these materials are not toxic to aquatic organisms, but they interfere with the penetration of sunlight and with recreational water use, and raise the costs of effluent treatment. The activated sludge process does not effectively degrade color bodies. Among other treatment methods, such as chemical precipitation, adsorption on activated carbon, and reverse osmosis, only the lime process is deemed practical for industrial large-scale use. Developed and patented in the USA, it involves mixing of the effluent with lime and sedimentation of the resulting precipitate, followed by dewatering to 40-60% dryness for recycling to the causticizing plant of a kraft mill. Three American kraft mills have already introduced this process, namely, Interstate Paper Corp. at Riceboro, Georgia, Georgia-Pacific Corp. at Woodland, Maine, and Continental Can Co. at Hodge, Louisiana. Operating experiences at these three locations are described. Also mentioned are pilot plant investigations at International Paper Co. and American Can Co. regarding lime treatment for decoloring of bleach plant effluents, as well as on modifications of kraft pulp bleaching processes aimed at reducing the load of colored substances in waste waters. (Stapinski-IPC)
W73-12544

ENVIRONMENTAL CARE AT PULP MILLS, RESULTS AND EXPECTATIONS,
National Swedish Environment Protection Board, Stockholm. Environmental Care Project.
K-E. Lekander.
Svensk Papperstidning, Vol 75, No 1, p 5-14, January 15, 1972. 17 fig, 2 tab.

Descriptors: *Pulp and paper industry, *Foreign research, *Pollution abatement, Governments, Water reuse, Oxygen, Treatment, Economic impact, Research and development, Budgeting, Industrial wastes, Water pollution treatment, Waste treatment, Waste water treatment, Europe.
Identifiers: *Sweden, Kraft mills, Sulfite mills, Bleaching, Condensates.

Several of the research projects currently conducted by the Swedish National Environmental Protection Board (SSVL) under a five million dollar budget for the years 1970-1973 are discussed. They concern water recirculation in a closed kraft pulp and paper mill system; the same system in combination with oxygen bleaching; the reuse of overflows and accidental spill waters; and the treatment of condensates at kraft and sulfite mills. Results expected of these studied should permit new mills to be constructed from 1976 on to operate essentially free of water pollution without endangering their competitive market position. (Brown-IPC)
W73-12545

VOLATILE BIOCHEMICAL OXYGEN-CONSUMING MATERIALS OCCURRING IN THE SULFITE PROCESS WITH LIQUOR NEUTRALIZATION AND CONDENSATE RECOVERY: THEORETICAL STUDY, (FLYKTIGA BIOKEMISK SYREFORBRUKANDE AMNENS UPPTRADANDE I SULFITPROCESSEN VID LUTNEUTRALISERING OCH KONDENSATATERFORING, TEORETISK UNDERSOKNING),
Angpanneforeningen, Stockholm (Sweden).
O. Axelsson, and L. G. Wahlund.
Svensk Papperstidning, Vol 75, No 8, p 287-296, April 30, 1972. 9 fig, 9 tab. English summary.

Descriptors: *Pulp wastes, *Sulfite liquors, *Water reuse, Water pollution control, Industrial wastes, *Waste water treatment, Evaporation, Neutralization, Biochemical oxygen demand, Recycling, Theoretical analysis, Water pollution, Pollutants, Byproducts, Hydrogen ion concentration, Water conservation.
Identifiers: Sulfite pulping, Spent sulfite liquors, Condensates, Acetic acid, Furfural, Methanol, Chemical recovery.

A theoretical calculation was made of the effects to be expected in sulfite pulp mills in which spent sulfite liquor is neutralized and recycled to the wood digester along with recovered evaporator condensates obtained at different liquor pH and with varying degrees of condensate reuse. Complete closing of the liquor cycle was found to be impossible, because the volume of condensates exceeds the water demand of the acid-making (cooking liquor preparation) system. Excess condensates may conceivably be reused as wash water in a sectional spent liquor recovery system, a major proportion being introduced into the dilute ('thin') liquor, while a minor portion would accompany the washed pulp and be lost down the screen room sewer. The neutralization of thin liquor affects only the acidic impurities and should decrease the biochemical oxygen demand by up to 50%. The same effect upon acetic acid is obtained when condensate is recycled. This should decrease sewer losses of methyl alcohol and furfural to 15%, since a part of these compounds will be entrained by flue gases in the acid-making stage. By combining the neutralization of thin liquor with recycling of condensates, the acetic and formic

acid losses could be limited to about 10% of the total amounts formed, so that only about 10% of all oxygen consuming volatiles would be discharged with the mill's aqueous effluent. (Brown-IPC)
W73-12546

MICROBIOLOGICAL TREATMENT PARAMETERS OF BLEACHED KRAFT PULP MILL EFFLUENTS,
British Columbia Research Council, Vancouver.
C. C. Walden, A. E. Birkbeck, and J. C. Mueller.
Pulp and Paper Magazine of Canada, Vol. 73, No. 6, p 49-54 (p T153-T158), June, 1972. 9 fig, 14 ref.

Descriptors: *Pulp wastes, *Biological treatment, *Waste water treatment, *Activated sludge, Biochemical oxygen demand, Fermentation, Biodegradation, Microbiology, Microorganisms, Effluents, Pulp and paper industry, Sludge, Bleaching wastes, *Canada.
Identifiers: *Kraft mills, Kraft pulping, Process variables, Continuous process, Batch process, *British Columbia.

The microbiological treatment of effluents from a bleached kraft pulp mill requires acclimation of the inoculum. Even modest changes in biochemical oxygen demand result in major losses of acclimated sludge solids. Similar effects were not evident in the conventional five-day BOD test, owing to effluent dilution. For a bleached kraft mill effluent, the five-day BOD was found to measure only 0.84% of the thirty-day BOD. Batchwise and continuous fermentations of effluents from various coastal and inland kraft mills in British Columbia were conducted in order to elaborate various process paramenters of a low-rate activated sludge process with 24-hr detention time. Disperse sludge growth, albeit highly active, was observed with some effluents from an inland mill. However, this may be attributable to the individual samples examined, rather than to the low-rate 24-hr detention system. (Brown-IPC)
W73-12551

ADVANCED POLLUTION ABATEMENT TECHNOLOGY IN THE PULP AND PAPER INDUSTRY.
Organization for Economic Co-Operation and Development, Paris (France).

Document No. 86020, 1972. 223 p, 3 fig, 5 tab, 15 annexes.

Descriptors: *Pulp and paper industry, Water pollution, *Pollution abatement, Technology, *Economic feasibility, Water pollution treatment, Air pollution, Economic impact, Economic efficiency, Costs, Economic impact, Water reuse, *Waste water treatment, Pulp wastes, Bleaching wastes, Oxygen, Industrial wastes, Effluents, Color, Research and development, Sulfur compounds, Chlorine compounds, Water conservation, Foreign research, Pollutants, Waste water (Pollution).
Identifiers: *Bleaching, *Pulping, Sulfite pulping, Kraft pulping, Pulp washing, Counter-current processes, Chemical pulping, Oxygen bleaching, Mechanical pulping, Newsprint.

An international study by OECD experts on paper industry water and air pollution problems and control technologies arrived at the following major conclusions: Presently accepted in-plant techniques can cut pollution loads in older pulp and paper mills by about 50%. External treatments can decrease effluent pollution loads by 75 to 90%. A 90% reduction of wastes may add $7 to $9 to the cost per ton of bleached kraft pulp. Current efforts to develop pulping and bleaching processes without use of sulfur and chlorine compounds should eliminate odorous air emissions, reduce water consumption, and permit recycling of bleaching effluent. The oxygen bleaching process holds particular promise for controlling effluent color. Improved mechanical (groundwood) pulping methods, while conserving raw material, can minimize the need for chemical pulps in newsprint furnishes. Water requirements and pollution loads are being reduced also by use of countercurrent washing techniques. These and other innovations will require significant research and development expenditures by the paper industry. Their impacts should become felt within 15-20 years. The color removal problem may be solved within a decade. Detailed evaluations are presented of various laboratory and pilot stage approaches with regard to commercial feasibility and economic and environmental implications. (Brown-IPC)
W73-12552

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. I. GENERAL AND IN-PLANT MODIFICATIONS,
Institute of Paper Chemistry, Appleton, Wis.
J. Weiner, and L. Roth.
Available from Institute of Paper Chemistry, Appleton, Wis., ($15.00). Bibliographic Series, No. 251, 1972. 127 p, 503 ref.

Descriptors: *Water pollution, *Pulp and paper industry, *Bibliographies, Legislation, Pollution abatement, Conferences, Surveys, Pulp wastes, Industrial wastes, Waste waters, Water conservation, Industrial water, Effluents, Design, Operation and maintenance, Technology, Waste water treatment.
Identifiers: Process modifications.

This is the first of a series of six annotated and indexed bibliographies. It deals with federal and state antipollution legislation, general survey and review articles, monographs, and conferences on water pollution in the paper industry, as well as with such changes in pulp and paper mill design and operating technologies that will reduce the volume of discharged aqueous effluents. The publications quoted span the time period from about 1950 to 1970. (See W73-12554 thru W73-12558) (Brown-IPC)
W73-12553

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. II. TESTING METHODS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05A.
W73-12554

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. III. STREAM RESPONSE,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05C.
W73-12555

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. A. PHYSICAL OPERATIONS,
Institute of Paper Chemistry, Appleton, Wis.
J. Weiner, and L. Roth.
Available from the Institute of Paper Chemistry, Appleton, Wis., ($15.00). Bibliographic Series, No 254, 1972. 159 p, 502 ref

Descriptors: *Water pollution, *Pulp and paper industry, *Water pollution treatment, *Physical control, *Bibliographies, Coagulation, Filtration, Flotation, Evaporation, Ion exchange, Adsorption, Crystallization, Operations, Sludge, Dewatering, Disposal, Waste disposal, Waste waters, *Waste water treatment, Pulp wastes, Industrial wastes, Ultimate disposal, Effluents, Treatment, Pollution abatement.
Identifiers: Concentrating.

This is the fourth part of a six-part annotated and indexed bibliography covering the pertinent literature published between about 1950 and 1970. It cites references to waste water and industrial effluent treatment by sedimentation, coagulation, filtration, flotation, adsorption, general and specific concentration processes, and related physical methods. The characteristics, dewatering, and ultimate disposal of sludges produced are also dealt with. (See also W73-12553) (Brown-IPC)
W73-12556

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. B. BIOLOGICAL SYSTEMS,
Institute of Paper Chemistry, Appleton, Wis.
J. Weiner, and L. Roth.
Available from the Institute of Paper Chemistry, Appleton, Wisconsin. ($17.00). Bibliographic Series, No 255, 1972. 203 p, 584 ref.

Descriptors: *Water pollution, *Water pollution treatment, *Bibliographies, *Pulp and paper industry, *Biological treatment, Activated sludge, Aerobic treatment, Anaerobic digestion, Biodegradation, Fermentation, Sewage treatment, Disposal, Ultimate disposal, Sludge, Industrial wastes, Waste disposal, Waste treatment, Deep wells, Diffusion, Pollution abatement, *Waste water treatment, Filtration, Lagoons, Soil disposal fields.
Identifiers: Diffusers.

This fifth in a series of six annotated and indexed bibliographies covering the literature published between about 1950 and 1970 deals with the treatment of paper industry waste waters by lagooning, biological filtration, aerobic and anaerobic digestion, fermentation, activated sludge processes, and combined biological purification schemes, including joint treatments with municipal sewage. Methods for the ultimate disposal of treated effluent residues on land, in deep wells, via diffusers, and by other means are also covered. (See also W73-12553) (Brown-IPC)
W73-12557

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. C. CHEMICAL PROCESSES, GENERAL OBSERVATIONS, AND REPORTS,
Institute of Paper Chemistry, Appleton, Wis.
J. Weiner, and L. Roth.
Available from the Institute of Paper Chemistry, Appleton, Wisconsin. ($12.00). Bibliographic Series, No. 256, 1972. 113 p, 362 ref.

Descriptors: *Water pollution, *Pulp and paper industry, *Bibliographies, *Chemcontrol, *Water pollution treatment, Neutralization, Oxidation, Reduction, Chemical reactions, Radiation, Byproducts, Waste waters, *Waste water treatment, Pulp wastes, Pollutants, Color, Toxicity, Incineration, Hydrogen ion concentration, Pollution abatement.
Identifiers: Combustion, Fluidized beds, Pyrolysis, Decoloration, Chemical recovery, Spent liquors.

This last part of a six-part annotated and indexed bibliography spanning the published literature period of 1950 to about 1970 is devoted to chemical methods for the treatment of paper industry waste waters and spent liquors. They cover combustion, fluidized-bed pyrolysis, pH control and neutralization, oxidation-reduction reactions, the use of nuclear radiations, and various special treatment methods. Also included are references to miscellaneous combined treatments of wastes for reduction of water pollution, removal of colored and toxic components, recovery of byproducts, and general observations excluded from the first five bibliographies. (See also W73-12553) (Brown-IPC)
W73-12558

ACTIVATED SLUDGE TREATMENT WITH OXYGEN,
Robert A. Taft Water Research Center, Cincinnati, Ohio.
J. B. Stamberg, D. F. Bishop, and G. Kumke.
Available from NTIS, Springfield, Va. 22151, as PB-214 564 Price $3.00 printed copy; $1.45 microfiche. Report, March 1971. 29 p, 6 fig, 5 tab.

Descriptors: *Waste water treatment, *Municipal wastes, *Activated sludge, *District of Columbia, Pilot plants, Research and Development, Methodology, Oxygenation, Sludge treatment, Solid wastes, Suspended solids, Aeration, Biochemical oxygen demand, Water quality control.
Identifiers: Solids retention time.

The Environmental Protection Agency Washington, D.C., Pilot Plant has been evaluating the oxygen-activated sludge treatment process since May 1970. An oxygen-activated system, consisting of a unique gastight biological reactor with less than 2.5 hours of aeration time and gravity clarification, produces effluents comparable in BOD and suspended solids to those of a parallel diffused aeration system with an aeration time of 3.6 hours. Consistently over 95% of the supplied oxygen was utilized in the reactor which employed co-current liquid and gas flow contacting. The mixed liquor suspended solids were maintained between 4,000 and 6,000 mg per liter. The mixed liquor increased to over 8,000 mg per liter when operated with alum addition for phosphorus removal. The underflow solids concentrations were between 1.0% and 1.4% without alum and 2.14% during the alum addition period. Visually, the microbial organisms were essentially the same as a typical conventional system; however, their rate of activity was greater above a solids retention time (SRT) of 6 days. The total production of solids was significantly less than the similarly operated diffused air system above an SRT of 6 days. As little as 0.35 lb of solids/lb of BOD was produced at an SRT of 13 days. Filamentous growth was observed below an SRT of 5 days, but not above. In warmer temperature periods, peak overflow rates of 1,940 gal per day per sq ft were observed. In the colder temperature periods, overflow rates of 975 gal per day per sq ft were the maximum obtained during the first year's operation. (Woodard-USGS)
W73-12586

TREATMENT OF SOYBEAN OIL SOAPSTOCK TO REDUCE POLLUTION,
Agricultural Research Service, Peoria, Ill. Northern Regional Research Lab.
R. E. Beal, V. E. Sohns, and H. Menge.
J Am Oil Chem Soc. Vol 49, No 8, p 447-450. 1972.
Identifiers: Broiler feed, Pigmentation, Pollution, Soapstock, *Soybean oil, *Waste water treatment.

Often soapstock is acidulated to convert this byproduct of vegetable oil refining to a salable commodity. The acidic waste water from this treatment constituted a significant part of the environmental pollution from refineries. A process of neutralizing and drying was investigated as a nonpolluting method for upgrading soybean oil soapstock. Neutralization with sulfuric acid was conducted in a ribbon blender. The neutral soapstock was dired to 4% moisture, either batchwise in a natural circulation evaporator or continuously in a scraped film evaporator. The product is liquid while hot but solidifies to a waxy solid when cooled to room temperature. When added to a standard broiler ration, the feed efficiency and rate of gain of chickens equaled that obtained with a commercial feed fat added at the same level. The soapstock products feed, which contained 200-300 ppm xanthophyll, gave significantly better shank pigmentation than the commercial fat, which contained 3 ppm.--Copyright 1973, Biological Abstracts, Inc.
W73-12668

SELECTION OF A SUITABLE SYSTEM OF EFFLUENT PURIFICATION (O VYBORE RATSIONAL'NOI SISTEMY OCHISTKI STOCHNYKH VOD),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti, Leningrad (USSR).
M. A. Evilevich, and M. M. Nikiforov.
Bumazhnaya Promyshlennost, No 1, p 14-16, January 1972.

Descriptors: *Pulp wastes, *Waste water (Pollution), *Discharge (Water), *Legal aspects, Pulp and paper industry, Effluents, Treatment, Aeration, Biodegradation, Biochemical oxygen demand, Foreign countries, Water pollution control, Pollution abatement, Industrial wastes, Water pollution treatment, Pollutants, Discharge frequency, Toxicity, *Waste water treatment, Water quality control, Fish, Aquatic lire, Costs, Feasibility studies, Economic feasibility, Water pollution, Waste dilution, Water law, Stream pollution.
Identifiers: *Amur River, *Lignin, USSR.

Soviet government regulations for permissible discharges of pulp and paper mill effluents are criticized as unrealistic. Thus, the Amur River Mills may unload their waste waters only during six months of the year, and the five-day biochemical oxygen demand of discharged wastes must not exceed 2 mg per liter. This requirement could not be met, despite costly storage facilities, because of the slow biodegradation of alkali lignin. Even prolonged aeration will not reduce the five-day biochemical oxygen demand of kraft mill wastes below 5 to 6 mg per liter. Experimental evidence suggests this level to be harmless to water quality and to fish, particularly when additional purification is used to eliminate toxic constituents for which the biochemical oxygen demand is a poor indicator. Recommendations for realistic effluent treatments are made, depending on various feasible dilution factors and upon the dynamics of the receiving waters (flowing streams versus stagnant waters). (Stapinski-IPC)
W73-12673

ENCOURAGE APPLIED RESEARCH AND PUBLISH THE FINDINGS,
Minnesota Mining and Mfg. Co., St. Paul.
For primary bibliographic entry see Field 05G.
W73-12758

PETROLEUM...40 YEARS OF RESEARCH,
Secony Mobil Oil Co., Inc., New York.
For primary bibliographic entry see Field 03E.
W73-12768

SIGNIFICANCE OF HEATING AGRICULTURAL SOILS,
Indian Inst. of Science, Bangalore. Dept. of Biochemistry.
For primary bibliographic entry see Field 03F.
W73-12802

REUSE OF HUMAN WASTES IN AGRICULTURE,
Asian Inst. of Tech., Bangkok (Thailand).
M. G. McGarry, S. M. A. Durrani, and W. Chuapohuck.
Thai J Agric Sci. Vol 5, No 3, p 183-194, 1972, Illus.
Identifiers: *Agriculture, Algae, Animals, Fish, *Human wastes, Reuse, *Wastes reuse.

More than 90% of materials used by man are wasted to the environment. Asian farmers recycled human and animal wastes on farms for centuries. Human excreta was a preferred fertilizer for vegetable and fish farming. The farmer effected increased yields at a lower cost and improved the urban environment through water pollution control. The uses, benefits, and health hazards resulting from human excreta on the farm are described. The Applied Scientific Research Corporation of Thailand and the Asian Institute of Technology jointly investigated the production of algae by using an open pond fed with sewage. The effluent was distributed to fish production ponds. The fish utilized the algae and other organisms in the treated waste water as a source of nutrients.--Copyright 1973, Biological Abstracts, Inc.
W73-12817

WPCF PROJECT REPORT: A STATE CERTIFICATION PROGRAM GUIDE,
Water Pollution Control Federation, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-12842

CHARACTERIZATION OF CHEMICAL SLUDGES,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05A.
W73-12871

ATP POOLS IN PURE AND MIXED CULTURES,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05A.
W73-12887

MICROBIOLOGY IN THE AEROBIC TREATMENT OF FARM WASTE,
Reading Univ. (England).
J. M. Grainger.
Process Biochemistry, Vol 8, No 3, p 28-30, March 1973. 28 ref.

Descriptors: *Farm wastes, *Waste water treatment, *Isolation, *Microbial degradation, *Methodology, *Aerobic treatment, Protozoa, Waste disposal, Aerobic bacteria, Pathogenic bacteria, Microscopy, Slurries, Waste dilution, Reviews, Incubation, Sewage bacteria, Temperature, Pollutant identification.
Identifiers: *Enumeration, *Heterotrophic microorganisms, Culture media, Staining, Sample preparation, Homogenization, Inoculation, Agars, Vorticella.

Procedures are reviewed for the enumeration and isolation of heterotrophic microorganisms of aerobic systems for treatment of farm slurry. An introduction to the subject is presented based largely on accepted microbiological practice. Areas of consideration are microscopical procedures and isolation methods including handling of samples, dilution and homogenization, media composition, inoculation methods, and temperature and period of incubation. (Mortland-Battelle)
W73-12890

LAND DISPOSAL OF LIQUID SEWAGE SLUDGE: I. THE EFFECT ON YIELD, IN VIVO DIGESTIBILITY, AND CHEMICAL COMPOSITION OF COASTAL BERMUDAGRASS (CYNODON DACTYLON L. PERS.),
Guelph Univ. (Ontario). Dept. of Land Resource Science.
D. King, and H. D. Morris.
J Environ Qual. Vol 1, No 3, p 325-329, 1972, Illus.
Identifiers: Bacteria, *Bermuda grass, Chemical composition, Coliform, Cynodon-Dactylon, Digestibility, Disposal, Fertilizer, Grass, *Land disposal, Potassium, *Sewage sludge, Yield, Zinc, *Sludge disposal.

The disposal of liquid sewage sludge on established Coastal bermudagrass sod was studied over a 2-yr period. Rates of sludge application up to 20 cm/yr were compared with a conventional fertilizer treatment. In 1969 there were no significant differences among the 3 highest sludge rates

and all sludge rates were superior to chemical fertilizer (224n37-97 kg/ha NPK) in forage production. In 1970 no significant differences were found among the 3 top rates of sludge and a higher rate of chemical fertilizer (358-112-224 kg/ha NPK) that was used. Sludge applications had little effect on in vivo digestibility of the forage. The K level of the forage was initially increased by sludge applications but steadily declined during the last half of the 1969 season and the entire 1970 season. Sludge applications increased the N and Na level of the forage but had little or no effect on P, Ca, Mg, Mn, B, Cu, Mo, and Ni. Zn content of the forage increased with increasing sludge rate and number of application through the second clipping in 1970. Although Zn levels of 340 ppm were fouund no reduction in yield resulted. There was no significant survival of coliform bacteria on the forage at harvest. Coastal bermudagrass is a well-adapted crop for sludge disposal areas.--Copyright 1973, Biological Abstracts, Inc.
W73-12914

5E. Ultimate Disposal of Wastes

WATER QUALITY HYDROLOGY OF LANDS RECEIVING FARM ANIMAL WASTES,
Texas A and M Univ., College Station Water Resources Inst.
For primary bibliographic entry see Field 05B.
W73-12353

WASTE WATER TREATMENT IN COMMERCIAL FISH PROCESSING: REDUCING STICK WATER LOADINGS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05D.
W73-12420

STUDY OF UTILIZATION AND DISPOSAL OF LIME SLUDGES CONTAINING PHOSPHATES,
Monsanto Research Corp., Dayton, Ohio. Dayton Lab.
For primary bibliographic entry see Field 05D.
W73-12501

GROUND WATER POLLUTION IN THE SOUTH CENTRAL STATES,
Robert S. Kerr Environmental Research Lab., Ada, Okla. National Ground Water Research Program.
For primary bibliographic entry see Field 05B.
W73-12515

DEMOSTRATION OF A WASTE DISPOSAL SYSTEM FOR LIVESTOCK WASTE,
Moore Engineering, Inc., West Fargo, N. Dak.
For primary bibliographic entry see Field 05D.
W73-12517

METHODS FOR PULP AND PAPER MILL SLUDGE UTILIZATION AND DISPOSAL,
Crown Zellerbach Corp. Camas, Wash. Environmental Services Div.
T. R. Aspitarte, A. S. Rosenfeld, B. C. Smale, and H. R. Amberg.
Copy available from GPO Sup Doc as EP1.23/2 73-232, $2.10; microfiche from NTIS as PB-222 254, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-232, May 1973. 139 p, 34 fig, 45 tab, 6 ref. EPA Project 12040 ESV.

Descriptors: *Sludge disposal, *Soil treatment, Agriculture, Industrial wastes, *Pulp wastes, Sludge, *Wood wastes, Capital costs, Operating costs, *Incineration, Burning, Drying, *Crop production, Decomposing organic matter, Effluents, Odor, Phytotoxicity, Solid wastes, *Washington.
Identifiers: Cattle feed, Cattle bedding, Nematode control, Morel growth, Synthetic potting media, Camas (Wash).

The disposal of pulp and paper mill sludge in a manner which has minimal effect on the environment has become a serious problem. Four methods of disposal were evaluated, namely: (1) incineration in an air entrained dryer-incinerator, (2) burining in hog fuel boilers, (3) incorporation into soil as an amendment, and (4) hydromulching for soil stabilization. Other possible uses are discussed. Burning sludge in incinerators costs between $11 and $13/dry ton, including all prior dewatering steps. Sludge can be made available at various degrees of dewatering at costs of from $7 to $20/dry ton. Incorporation into farm soil offers the possibility for disposal of large quantities of sludge. At low levels (100-200 tons/acre) crop yields are satisfactory, provided adequate nitrogen is added. A high level incorporation (600 tons/acre) requires a year of fallow preceding crop planting. Sludge alone or in combination with bark can be used as a hydromulch in establishing grass stands on steep embankments. (EPA)
W73-12519

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. A. PHYSICAL OPERATIONS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12556

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. B. BIOLOGICAL SYSTEMS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12557

DELAWARE ESTUARY, PENNSYLVANIA, NEW JERSEY, AND DELAWARE, LONG-RANGE DREDGED SPOIL DISPOSAL PROBLEM.
Committee on Tidal Hydraulics (Army), Washington, D.C.

U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, May 1968. 28 p, 3 pl.

Descriptors: *Dredging, *Spoil banks, *Shoals, *Pennsylvania.
Identifiers: *Delaware Estuary, *Navigation channels, Marcus Hook (Penn).

A large part of recurring shoaling occurs in the vicinity of Marcus Hook, Pennsylvania. Both banks of the waterway in this locality are extensively developed, making the disposal area problem especially acute. Views of the Committee on Tidal Hydraulics are given on the following points: Sources of material in the Marcus Hook shoal; composition of Marcus Hook shoal; mechanics of deposition of the shoal at Marcus Hook; industrial use of water; correlation of volumes contributed and volumes of shoaling; beneficial use of materials in disposal areas; dehydration of disposal areas; and low density of effluent from dredge pumps. There will be no remaining capacity for disposal in a relatively short time if present procedures for dredging and disposal continue and if heavy shoaling continues in the reach. Discussion is given of possible measures to resolve the problem. These measures are: (a) Materially reduce contributions of shoaling material from the various sources; (b) Undertake works in the estuary that will cause transfer of most of the shoaling far downstream where disposal area capacity is available to meet the needs for many years; (c) Dredge the shoals in the critical reach, but transport the spoil by barge or pipeline to distant disposal areas. (Garrett-WES)
W73-12560

DISPOSAL OF DREDGE SPOIL; PROBLEM IDENTIFICATION AND ASSESSMENT AND RESEARCH PROGRAM DEVELOPMENT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 04A.
W73-12573

SURVEY OF INDUSTRIAL WASTE INJECTION WELLS, VOLUME II,
Missouri Univ., Rolla. Dept. of Geological Engineering.
D. L. Warner.
Available from NTIS, Springfield, Va. 22151, as AD-756-642 Price $9.00 printed copy; $1.45 microfiche. Final Technical Rept, June 1972. 677p. USGS 14-01-001-12280.

Descriptors: *Waste disposal wells, *Disposal, *Injection wells, Louisiana, Michigan, New Mexico, Nevada, New York, North Carolina, Ohio, Oklahoma, Pennsylvania.

This report consists of 246 forms describing individual wastewater injection well that have been inventoried. A table (in Volume I) lists the 22 states in which wells are known to exist and the number of wells inventoried. The forms are grouped by state and arranged approximately chronologically within each state. All wells that have been constructed for injection of industrial wastewaters into saline water aquifers were included. In addition to operative wells, some of the wells in the survey have never been operated; others have been operated, but are now inactive or abandoned. Oil field brine injection wells are not included, nor are wells used exclusively for injection of sewage effluent. Volume II contains information for Louisiana, Michigan, New Mexico, Nevada, New York, North Carolina, Ohio, Oklahoma, and Pennsylvania. (See also W73-12051) (Knapp-USGS)
W73-12576

MAINTENANCE OF THE HUDSON RIVER CHANNEL, NEW YORK, NAVIGATION PROJECT, (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 08B.
W73-12588

AN EFFICIENT METHOD OF DEWATERING EFFLUENT SEDIMENTS (EFFEKTIVNYI SPOSOB OBEZVOZHIVANIYA OSADKOV STOCHNIKH VOD),
L. I. Shmidt, V. M. Shapchenko, V. V. Lobko, O. B. Makarov, and V. V. Irtegov.
Bumazhnaya Promyshlennost, No 2, p 14-15, February 1972. 1 fig, 2 tab, 5 ref.

Descriptors: *Sludge treatment, *Dewatering, Effluents, Pulp wastes, Pulp and paper industry, Biological treatment, Waste water treatment, Sediments, Pressure, Suspended solids, Coagulation, Chemcontrol, Storage, Reservoir storage, Freeze drying, Winter, Pressure, Flotation, Polymers, Waste disposal, Sludge disposal, Foreign research.
Identifiers: Compressed air, Aluminum compounds, Polyacrylamide, Kraft mills, USSR.

The aqueous effluents from the Baikal kraft pulp and paper mill are subjected to biological purification and subsequent coagulation with aluminum hydroxide sol. The resulting sediment comprises 13-14 percent of the effluent volume and contains 99.7-99.8 per cent water in addition to lignin, fibers, and coagulant solids. This sediment is transferred to a storage area and allowed to freeze in winter to reduce its volume by a factor of 40-50. Among various methods investigated for improving the dewatering efficiency, the most satisfactory results were obtained with pressure flotation of the kind widely used in the petroleum industry.

This process involves essentially the saturation of the sludge with compressed air, followed by sudden pressure release. The evolving air bubbles float the solid particles to the surface. In the pilot plant installation described, the application of air under 2 atm pressure was following by addition of polyacrylamide as coagulant in amounts of 3.1 to 0.5 mg per liter. This reduced the water content of the sediment by 95.1 to 95.7 per cent, while reducing the total sediment volume by a factor of 22 to 24. The liquid separated from the sludge contained only 2.7 to 6.0 mg of suspended solids per liter and could be disposed of without further treatment. (Stapinski-IPC)
W73-12674

PETROLEUM...40 YEARS OF RESEARCH,
Secony Mobil Oil Co., Inc., New York.
For primary bibliographic entry see Field 03E.
W73-12768

PROBLEMS OF GROUNDWATER POLLUTION BY BRINE,
Public Health Service, Dallas, Tex. Region VII.
For primary bibliographic entry see Field 05B.
W73-12770

WASTE DISPOSAL WELL PERFORMANCE,
Monsanto Biodize Systems, Inc., Great Neck, N.Y.
R. W. Payne.
Water and Wastes Engineering, Vol 7, No 7, p D-14 - D-18, July 1970. 4 fig, 7 ref.

Descriptors: Deep well disposal, *Injection wells, *Waste disposal wells, *Waste water disposal, Industrial wastes, Hydraulics, Permeability, Reservoirs.
Identifiers: *Injection horizon, *Semi-infinite aquifers, Intrained solids, Well development.

After a waste disposal well has been receiving water for a period of time, the injection pressures may be expected to rise. The wells performance must be analyzed to determine what fraction of the total increase is geologically inevitable so that the necessity and benefits of clean out or remedial work can be determined. Mathematical methods are presented for analyzing and predicting the changes in an industrial waste disposal wells pressure-rate relationship with time. Although these methods are widely used by the petroleum industry their applicability is relatively unknown to operators of industrial waste wells. Terms relating uniquely to the petroleum industry have been eliminated. Calculations based on long term performance of a Monsanto waste disposal well are used to evaluate the well work-over. A graphic solution is given for developing similar data for short-term shut-in tests. (Smith-NWWA)
W73-12779

THE DESIGN AND OPERATION OF DEEP-WELL DISPOSAL SYSTEM,
Chemstrand Corp., Pensacola, Fla. Utilities Assistance Group.
B. T. Dean.
Journal Water Pollution Control Federation, Vol 37, No 2, p 245-254, February 1965. 7 fig, 2 tab.

Descriptors: Wells, *Injection wells, *Waste disposal wells, *Aquifer characteristics, Industrial wastes, Hydraulics, Recharge, *Artesian aquifer, Permeability, Cement grouting, Water pollution, Dissolved oxygen, Chemical oxygen demand, *Florida.
Identifiers: *Pensacola (Florida), *Well design, Salinity, Escambia River, Bio-oxidation waste treatment system, Liquid ion-exchange process.

Increased production of waste materials and the associated costs of surface disposal at the Pensacola, Florida plant of the Chemstrand Corp. caused management to seek new disposal techniques. In cooperation with the U.S. Geological Survey a high saline artesian aquifer at a depth of 1400 feet with a westward regional dip was chosen as a potential waste disposal zone. Upon the completion of test drilling it was determined by chemical and hydraulic analysis that the aquifer waters were compatible with the wastes and injection could be satisfactorily achieved. The disposal well system was completed, with modifications from the initial plan, to fit special conditions and the borehole was cemented from the barrier bed to the surface with the open portion completely intersecting the disposal zone. A shallow monitor well in an intermediate aquifer was completed to assure no vertical leakage from the pressurized disposal zone occurred. Subsequent operations have proven very acceptable and at present it appears that deep well disposal of aqueous wastes is an extremely satisfactory method because of its simplicity, finality and economy. (Smith-NWWA)
W73-12780

THE DISPOSAL OF WASTEWATER UNDERGROUND,
R. M. Winar.
Industrial Water Engineering, Vol 4, No 3, p 21-24, March 1967. 3 fig, 4 ref.

Descriptors: Wells, *Injection wells, *Waste disposal wells, Waste water disposal, *Underground storage, Water storage, Reservoirs, *Recharge, Permeability, Hydraulics, *Biochemical oxygen demand.
Identifiers: Salt cavities, Fracture zones, Hydraulic pressures, Chemical composition.

In recent years there has emerged an increasing awareness of the suitability of underground storage for wastes. Deep well injection into suitable aquifers as a prime method of industrial waste disposal has emerged from the slow, steady technological growth of the 1950s and has expanded rapidly in the last 10 years as indicated by the doubling of waste disposal wells between 1963 and 1966. Although 86% of the current disposal wells serve the chemical and refining industries, the great variety of effluents (brines, caustics, acids, plating liquors, chromates, cyanides, cooling waters, and a full range of organic-inorganic compounds) compatible with this disposal process indicates that many diverse industries i.e. metal fabricating, treating and plating, mining, paper and food processing will soon follow suit as the anti-pollution pressures of the public and government increase and the economics of this method become more and more favorable when compared to the costs of a surface treatment and disposal. (Smith-NWWA)
W73-12781

5F. Water Treatment and Quality Alteration

POSSIBILITIES OF WATER TREATMENT BY MEANS OF A MAGNETIC FIELD,
Glowny Instytut Gornictwa, Katowice (Poland).
For primary bibliographic entry see Field 05D.
W73-12481

CORROSION BY THE SULPHATE-REDUCING BACTERIA,
University of Manchester Inst. of Science and Technology (England). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05G.
W73-12756

COMPARISON OF WATERFLOOD CORROSION DETECTION AND MONITORING DEVICES,
Atlantic Richfield Co., Bakersfield, Calif.
For primary bibliographic entry see Field 08G.
W73-12757

IMPACT OF WATER FLUORIDATION ON DENTAL PRACTICE AND DENTAL MANPOWER,
Illinois Univ., Chicago. Coll. of Dentistry.
B. L. Douglas, D. A. Wallace, M. Lerner, and S. B. Coppersmith.
J Am Dent Assoc. Vol 84, No 2, p 355-367, 1972.
Identifiers: *Dental practices, *Fluoridation, Manpower, Water supply, Potable water.

Dentists in F-deficient communities appear to be busier in their practices than dentists in fluoridated communities, who feel less overworked and spend more time on each patient. Dentists in fluoridated communities earned larger gross and net incomes in 1965, even with degree of specialization, effort, etc., held constant. The differential persisted, even though it was reduced in a 1967 income survey. Fluoridation appears to extend the existing pool of dental manpower to cover a substantially larger population.–Copyright 1973, Biological Abstracts, Inc.
W73-12816

VIRUSES IN METROPOLITAN WATERS: CONCENTRATION BY POLYELECTROLYTES, FREEZE CONCENTRATION, AND ULTRAFILTRATION,
Chicago Board of Health, Ill.
S. H. Rubenstein, J. Fenters, H. Orbach, N. Shuber, and J. Reed.
Journal of the American Water Works Association, Vol 65, No 3, p 200-202, March 1973. 4 tab, 6 ref.

Descriptors: *Viruses, *Methodology, *Lake Michigan, Cultures, Bacteria, Surface waters, Water analysis, Streptococcus, Pollutant identification.
Identifiers: Concentration, *Freeze concentration, *Polyelectrolytes, *Ultrafiltration, Natural waters, Recovery, Sample preparation, Culture media, Plaque assay, Collaborative studies, Coxsackie B4 virus, Echo 6 virus, Poliovirus 1-Sabin, Isobutylene maleic anhydride, *Chicago River (Ill).

A collaborative study was conducted to compare viral concentration methodologies and to elicit data related to the viral status of Lake Michigan. One laboratory employed a concentration method utilizing an insoluble cross-linked polyelectrolyte of isobutylene maleic anhydride (IMA). The second laboratory used a method of freeze-concentration and ultrafiltration. In both cases, experimental model systems, seeded with poliovirus and echovirus, were operated in the laboratory and actual samples form Lake Michigan filtration plants and the Chicago River were tested. The recovery and concentration of viruses were shown to be practical, simple, and efficient with either method. Both allow for the processing of large volumes of water with minimum manipulation and a high degree of certainty of viral recovery. In the testing of actual samples, no viral agents were detected in Lake Michigan samples and only one Echovirus isolate was yielded by Chicago River samples. (Mortland-Battelle)
W73-12867

FLUORIDATION OR FLUORIDE SUPPLEMENTS: A STATEMENT BY THE NUTRITION COMMITTEE, CANADIAN PAEDIATRIC SOCIETY.
For primary bibliographic entry see Field 05G.
W73-12990

5G. Water Quality Control

SYSTEMS APPROACH TO METROPOLITAN AND REGIONAL AREA WATER AND SEWER PLANNING,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 06A.
W73-12351

CRITICAL REVIEW OF CURRENTLY AVAILABLE WATER QUALITY MODELS,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 06A.
W73-12352

IDENTIFICATION OF WATER RESOURCES PLANNING PROBLEMS IN THE METROPOLITAN AREA OF GREATER SAN ANTONIO AND ITS ASSOCIATED COUNTIES,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 06B.
W73-12354

REGIONAL SEWER SYSTEM, PLANNING AND COST ESTIMATION MODEL,
Regional Planning Council, Baltimore, Md.
A. G. Leary, and P. Zepp.
May 1968. 35 p, 2 fig, 4 tab, 1 append. HUD-Md.-P-61.

Descriptors: *Sewers, *Cost analysis, *Computer programs, *Model studies, Land use, Design criteria, Planning, *Maryland, Regional analysis, Regional development.
Identifiers: *Baltimore.

The purpose is to further develop a computer model to design and evaluate alternative sewer systems. The study expands an earlier report prepared for the Regional Planning Council by Alan M. Voorkees and Associates, Sewer System Cost Estimation Model. The key inputs to the model are the land use patterns to be served, the general physical layout of the sewer system, and some engineering design criteria. Principal outputs are various design data for specific sewer lines, unit costs, and total system costs. Model can be used to test the effect on costs of various land use patterns or plans and to determine the most efficient sewer system given a specific land use pattern. A short description of the computer model, flow diagrams of the computer program, and the results of a test problem are included. (Elfers - North Carolina)
W73-12357

COMPREHENSIVE PUBLIC WATER SUPPLY STUDY FOR SCHENECTADY COUNTY, NEW YORK.
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
For primary bibliographic entry see Field 03D.
W73-12358

SUMMARY REPORT: COMPREHENSIVE SEWERAGE STUDY FOR SCHENECTADY COUNTY, NEW YORK.
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.

June 1970. 24 p, 4 fig, 7 tab. N.Y. State Dept. of Health WPC-CS-176.

Descriptors: *Sewerage, *Planning, Projections, Cost analysis, Water quality, Coordination, *New York, *City planning.
Identifiers: *Schenectady County (New York), Mohawk River, Sewerage system expansion.

Two sections of Schenectady County, the eastern section including the Schenectady Metropolitan area and the rural-oriented western section are discussed. In the eastern section there have been several previous sewerage studies and this study brings together their findings within a broad perspective. Particular attention was placed on the effect on water quality of the Mohawk River from wastewater disposal and the question of whether each community in the metropolitan area should treat and dispose its own wastewater or handle it on a multimunicipal basis. In the western section it is recommended that individual disposal systems continue to be used except for three community centers where small collection and treatment systems are needed. Population and sewage flow projections, maps showing proposed system elements, and cost estimates for several alternative systems are included. (Elfers - North Carolina)
W73-12359

AN EVALUATION OF BALTIMORE HARBOR LAND USE POTENTIALS,
Regional Planning Council, Baltimore, Md.
For primary bibliographic entry see Field 06B.
W73-12361

INTERIM AREAWIDE WATER AND SEWER PLAN: BEL-O-MAR AREA.
Candeub, Fleissig and Associates, Newark, N.J.

Prepared for Bel-O-Mar Interstate Planning Commission, 1972. 56 p, 5 fig, 7 maps, 12 tab, 15 append. HUD West Virginia-84.

Descriptors: *Planning, *Water supply, *Sewerage, Land use, Environmental effects, Project planning, Administration, Coordination, *Ohio, *West Virginia, *Ohio River, *Interstate commissions, *Regional analysis.
Identifiers: Belmont County (Ohio), Ohio County (West Virginia), Marshall County (West Virginia).

Based on EPA and HUD requirements for areawide water and sewer plans, a planning framework and a short-range water and sewer project plan are presented for a three county area in Ohio and West Virginia. The most significant water resource in this area is the Ohio River, which is the primary water supply source and the receiving body of water for virtually all wastewater discharges. A detailed chart shows all significant intakes from and discharges into the river. Other topics include (1) the environmental impact of wastewater discharges; (2) existing water and sewer facilities; and (3) planning goals and objectives, existing land use patterns, and land use planning concepts. The short-range project plan is presented largely via tables listing specific projects and their costs and priorities. A long range policy plan on administration and financing also is presented. (Elfers - North Carolina)
W73-12362

SURVEY OF WATER TRANSPORTATION POTENTIAL TO REDUCE CONGESTION AND POLLUTION IN WASHINGTON, D.C. AND OTHER MAJOR CITIES.
Lulejian and Associates, Inc., Falls Church, Va.

Available from National Technical Information Service as COM-73-10253, $3.00 in paper copy, $1.45 in microfiche. Prepared for Department of Commerce, Maritime Administration, October 1972. 30 p, 20 fig. 2-36282 - Maritime Administration.

Descriptors: *Transportation, Navigation, Environmental effects, Economic feasibility, Hydrofoils, *Boats, Land use, Air pollution, *District of Columbia.
Identifiers: *Water transportation, Noise pollution.

The provision of transportation in large urban areas is increasingly becoming a major problem, especially in terms of efficiency and pollution. Water transportation offers a promising alternative because of the rapidly developing small boat technology, e.g. hydrofoils, and because most large cities are located on significant bodies of water. This alternative may also prove to be, as early studies indicate, better in terms of reduced noise levels and air pollution. This study focuses on Washington, D.C., and on the basis of travel patterns and various cost data, proposes and evaluates a water transportation system. Conclusions are: (1) such a system could be initiated in the near future, (2) it could be self-supporting, (3) it would have a minimal environmental impact, and (4) it would promote new commercial and recreational development along the waterways. (Elfers - North Carolina)
W73-12363

KAY COUNTY, OKLAHOMA, WATER AND SEWERAGE COMPREHENSIVE PLAN.
Evans and Nelson Engineering Co. and Associates, Ponca City, Okla.

Available from the National Technical Information Service as PB-213 565, $6.00 in paper copy, $1.45 in microfiche. Prepared for Office of Community Affairs and Planning, Oklahoma City, Oklahoma. June, 1972. 61 p, 28 fig, 10 tab. CPA-OK-06-56-1002.

Descriptors: *Water supply, *Sewerage, Rural areas, Data collections, *Oklahoma.
Identifiers: *Kay County (Okla), Inventories, Daw Dam (Okla), Kaw Reservoir (Okla).

Kay County in north central Oklahoma is rural with only a few small water and sewer systems. Groundwater is scarce except in areas adjacent to the Arkansas and Chickaskia Rivers. Impoundment of water in the Kaw Dam and Reservoir may provide water suitable for irrigation and industrial purposes and be a source of water supply for small communities. Basic data rather than plan and program formulation are presented as a first step in developing a water and sewer planning program for rural areas and cities under 5,000. Data include maps of existing water and sewer systems, maps of topography and soils, census data, political subdivision and land use maps, and descriptions of surface water and ground water resources in the county. (Elfers - North Carolina)
W73-12364

FUNCTIONAL WATER AND SEWERAGE PLAN AND PROGRAM, PEE DEE REGION, SOUTH CAROLINA.
LBC and W Associates, Columbia, S.C.

Available from the National Technical Information Service as PB-213 532, $10.25 in paper copy, $1.45 in microfiche. Prepared for Pee Dee Regional Planning and Development Council, Florence, South Carolina, May, 1972. 164 p, 31 ref. HUD-SC-04-00-0050 (g).

Descriptors: *Planning, *Water supply, *Sewerage, Urbanization, Land use, Comprehensive planning, Water demand, Environmental effects, Administration, Financing, *South Carolina, *Regional analysis.
Identifiers: Utility systems extension, *Pee Dee Region (South Carolina).

A continuing, comprehensive planning program concerned with facing problems of urbanization early before rapid urban growth occurs is being carried out by the Pee Dee Regional Planning and Development Council. The emphasis is not only one of providing adequate water and sewerage services, but also to plan these systems to help promote orderly patterns of growth. The study is closely related to population projections and land

use planning and includes discussions of planning determinants, goals and standards, environmental considerations, administration, and financial considerations. Each of the six counties in the region is analyzed separately for both water supply and sewerage systems. These analyses include an inventory of existing facilities, an analysis of water requirements and sewerage problems, and a proposed plan and program for water supply and sewerage. Analyses and plans are of a general nature due to the regional scope of the report and are largely based on previous planning and engineering studies made for individual jurisdictions. (Elfers - North Carolina)
W73-12365

THE LAKEFRONT PLAN OF CHICAGO.
Chicago, Ill.
For primary bibliographic entry see Field 04C.
W73-12367

THE NIAGARA RIVER POLLUTION ABATEMENT PROGRESS - 1971.

Available from the National Technical Information Service as PB-213 683, $3.00 in paper copy, $1.45 in microfiche. International Joint Commission--United States and Canada, Summary Report, August 1971. 8 fig, 4 tab.

Descriptors: *Pollution abatement, *Water quality standards, *Comprehensive planning, New York, Canada, Water pollution control, Water pollution effects, Water pollution sources, International Joint Commission, Legislation, Regulation, Programs, Law enforcement, Monitoring, Financing, Grants, Planning, United States, Lake Erie, Lake Ontario, St. Lawrence River.
Identifiers: *Niagara River, Ontario (Canada).

Pollution abatement in the Niagara Area since 1967 has progressed so that it will ultimately be reflected by improved water quality in the Niagara River, however, total anticipated improvement will not be realized until all planned abatement measures are completed and operative. All New York municipalities are adding secondary and phosphorus removal facilities. New York industries that chose to provide their own waste control measures have made significant progress, although they have not always succeeded in meeting established completion schedules. Requirements of the Ontario Water Resource Commission have been met by most Canadian industries. Water quality of the Niagara River will be markedly improved by the cumulative effect of waste treatment and control measures underway by 1975. New York State programs in effect to abate pollution are enforcement, comprehensive sewage studies with implementation of a master plan, pure waters construction grants, incentive programs, surveillance, and legislative and administrative changes regarding boat pollution, phosphorus, thermal criteria, lateral sewer construction aid, pesticides, and bulk storage, transportation and handling of hazardous substances. The Province of Ontario control program includes assistance to municipalities, phosphorus control, enforcement and hearings, contingency planning for handling spills, marina and boating legislation, disposal of dredging spoil, herbicides and pesticides, and surveillance. (Jones-Wisconsin)
W73-12380

BUFFALO CREEK DAM DISASTER: WHY IT HAPPENED,
Geological Survey, Arlington, Va.
For primary bibliographic entry see Field 04C.
W73-12411

CONTROL OF OIL AND OTHER HAZARDOUS MATERIALS.

Available from NTIS, Springfield, Va. 22151 as PB-213 880 - Price $6.00 printed copy; $1.45 microfiche. Environmental Protection Agency Publication, December 1971. 159 p.

Descriptors: *Water pollution sources, *Oil spills, *Chemicals, *Pollution abatement, Methodology, Transportation, Boats, Railroads, Highways, Water pollution control, Pollutants.
Identifiers: *Hazardous material spills.

More than two billion tons of potentially hazardous materials were produced and handled in the United States during 1968-1969. It is projected that the annual production quantities of these materials will approximate four billion tons in 1980. Over 70% of these quantities are transported by motor truck, railway, water barge, and pipeline. As long as the tonnage of liquid, solid and gaseous hazardous chemicals produced, handled, and transported by land and waterways continue to follow the present upward trend, the accidental spillage of these materials poses a real and growing threat of pollution to our water courses. Problems are discussed under the main topics: Hazardous Materials; Oil Spill Problem; Oil Characteristics; Oil Spill Prevention; Control and Treatment; and Legal Response. (Woodard-USGS)
W73-12427

VESSEL FOR THE REMOVAL OF OIL ON WATER,
S. Brydoy, and A. Sletsjoe.
U. S. Patent No. 3,737,040, 4 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 911, No 1, p 125, June 5, 1973.

Descriptors: *Patents, *Pollution abatement, Water quality control, *Oil pollution, *Oil spills, Skimming, Water pollution control, *Emulsifiers.
Identifiers: Barge-like vessels.

A vessel in the shape of a barge-like craft is used for carrying out both mechanical and chemical removal of oil from the surface of water. On each side of the intake section and extending in the normal direction of movement of the vessel, there are fastened sweeping arms which float on the water and direct the surface layer towards the intake. In the separation tank on board there is a skimmer for removal of floating oil. The skimmer is connected to a storage tank into which the oil may be pumped. Between the storage tank and the skimmer there may be inserted a container. The oil may then be pumped from the container to the storage minimizing the amount of air drawn into the pumping system. The dosaging device for the oil removing agent (emulsifier) is placed so that the agent may be sprayed or sprinkled down on the liquid. (Sinha-OEIS)
W73-12448

POLLUTANT RECOVERY SYSTEM,
J. J. Zerbe.
U.S. Patent No 3,734,294, 5 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 910, No 4, p 1174, May 22, 1973.

Descriptors: *Patents, Flotsam, *Oil spills, *Oil pollution, Equipment, *Pollution abatement, Water pollution control, Water quality control, Adsorption.
Identifiers: Polyurethane, Sorbent material.

A linkage of floats or booms is used to surround the pollutant floating on the water surface. It is placed down-wind or down-current to confine the pollutant to a small recovery area. The pollutant is seeded with a particulate, floatable sorbent material, such as granulated or ground polyurethane. Two seeder units are tethered to a platform and are available to distribute the sorbent material. The recovery device consists of a rotatable support with scoops mounted on it. The scoops are porous - allowing water to pass through but retain the sorbent material and adsorbed pollutants. Collection trays are positioned to receive the contents of the scoops to facilitate discharge of the contents of the scoops. (Sinha-OEIS)
W73-12456

ELECTROSTATIC CROP SPRAYING,
Hong Kong Univ.
For primary bibliographic entry see Field 03F.
W73-12482

MEASURING AND DEVELOPING METHODS OF ATTITUDE AND MOTIVATIONAL CHANGE IN IMPLEMENTING THE BIG BLUE RIVER BASIN WATER PLAN,
Doane Coll., Crete, Nebr.
For primary bibliographic entry see Field 06B.
W73-12491

NUMERICAL THERMAL PLUME MODEL FOR VERTICAL OUTFALLS IN SHALLOW WATER,
Oregon State Univ., Corvallis. Dept. of Mechanical and Nuclear Engineering.
For primary bibliographic entry see Field 05B.
W73-12506

COORDINATION OF AGRICULTURAL AND URBAN WATER QUALITY MANAGEMENT IN THE UTAH LAKE DRAINAGE AREA,
Colorado State Univ., Fort Collins. Environmental Resources Center.
W. R. Walker, T. L. Huntzinger, and G. V. Skogerboe.
Available from the National Technical Information Service as PB-222 280, $4.75 in paper copy, $1.45 in microfiche. Completion Report Series, Partial Report No 47, June 1973. 151 p, 24 fig, 21 tab, 23 ref. OWRR B-071-COLO (1).

Descriptors: Institutional constraints, Inter-basin transfer, *Mathematical models, *Optimization, Salinity, Urbanization, Waste water treatment, *Water quality, Water resources, Utah, *Water management (Applied), Model studies, *Cities, *Farm wastes.
Identifiers: *Utah Lake drainage area.

Like many other urbanizing river basins, the Utah Lake drainage area is faced with serious water quality degradation associated with expanding water use. While the region is not water-short, the downstream water users are encountering water deficiencies. To avoid aggravating these problems, water quality controls will be implemented in the Utah Lake drainage so that its future developments will not be harmfully reflected downstream. A model has been developed which optimized the allocation of water pollution abatement policies among agricultural and urban water uses. In addition, an analysis is made in which water quality management in areas surrounding Utah Lake is coordinated with the alternatives of lake diking and regional desalination. The results indicate that urbanization emphasizes control of urban pollution because of the inherent economies of scale in wastewater treatment facilities. On a basin-wide scale, desalting is the best strategy for future water quality management. (See also W73-12509 and W73-12510)
W73-12508

MATHEMATICAL MODELING OF WATER MANAGEMENT STRATEGIES IN URBANIZING RIVER BASINS,
Colorado State Univ., Fort Collins. Environmental Resources Center.
W. R. Walker, and G. V. Skogerboe.
Available from the National Technical Information Service as PB-222 281, $4.50 in paper copy,

$1.45 in microfiche. Completion Report Series Partial Report No 45, June 1973. 119 p, 16 fig, 1 tab, 32 ref. OWRR B-071-COLO (2).

Descriptors: Institutional constraints, *Mathematical models, Optimization, Systems analysis, Urbanization, Waste water treatment, *Water management (Applied), *Water quality, *Water supply, Model studies, Cities, *Colorado, *Utah, *Optimal development plans, Farm wastes.
Identifiers: *Arid-urbanizing areas, Denver (Colo), Utah Lake drainage area.

Water management in arid urbanizing regions requires careful evaluation of the alternative strategies for supplying future demands and control of water quality. Mathematical models were formulated to study the interrelationships that exist among various institutional factors in order to delineate the requirements for implementing optimal policies. Two study areas were selected on which to test the utility of the models. Denver, Colorado, was chosen as an area representing conditions of water scarcity and increasingly stringent water quality standards. The Utah Lake drainage area in central Utah presented conditions where water quality management is necessary to insure the continued use of water in the downstream population center of the state. Together these models produce results useful in determining the optimal strategies for water management in arid urbanizing areas. (See also W73-12508)
W73-12509

EVALUATION OF URBAN WATER MANAGEMENT POLICIES IN THE DENVER METROPOLITAN AREA,
Colorado State Univ., Fort Collins. Environmental Resources Center.
W. R. Walker, R. C. Ward, and G. V. Skogerboe.
Available from the National Technical Information Service as PB-222 282, $4.75 in paper copy, $1.45 in microfiche. Completion Report Series, Partial Report No 46, June 1973, 145 p, 30 fig, 1 tab, 34 ref. OWRR-B-071-COLO (3).

Descriptors: *Institutional constraints, Interbasin transfers, *Mathematical models, Optimization, Urbanization, Wastewater treatment, Water distribution systems, Water quality, Water resources, *Water reuse, Water treatment, *Colorado, *Cities, Model studies, *Optimal development plans, Water management (Applied).
Identifiers: *Denver (Colo).

A management level urban water system model has been developed to answer basic questions relating to optimal management of water in the urban environment. The model which coordinates water supply, distribution, and wastewater treatment is applied to the water management problems of the Denver, Colorado metropolitan area. Denver presently supplements diversions from the South Platte River with interbasin transfers, agricultural water right transfers, and groundwater. Although plans are being made to increase the capacity of these sources, increasingly stringent standards on wastewater effluents are enhancing the feasibility of reuse. In order to facilitate the implementation of optimal policies such as reuse, various institutional constraints must be evaluated. Certain of these including the legal interpretation of water rights, public opinions, management consolidation, and water quality control philosophies are explored. (See also W73-12508)
W73-12510

HERBICIDE CONTAMINATION OF SURFACE RUNOFF WATERS,
Utah State Univ., Logan. Dept. of Plant Science.
For primary bibliographic entry see Field 05B.
W73-12511

CONTROL OF MINE DRAINAGE FROM COAL MINE MINERAL WASTES - PHASE II - POLLUTION ABATEMENT AND MONITORING,
Consolidation Coal Co., Pinckneyville, Ill. Midwestern Div.
Z. V. Kosowski.
Copy available from GPO Sup Doc as EP1.23/2:73-230, $1.25; microfiche from NTIS as PB-222 252, $1.45. Environmental Protection Agency, Technology Seires Report, EPA-R2-73-230, May 1973. 83 p, 10 fig, 7 tab, 10 ref. EPA Project 14010 DDH.

Descriptors: *Mine drainage, Reclamation, Coal mines, *Illinois, Acid mine water, *Mine wastes, *Coal mine wastes, *Vegetation establishment, Erosion control, Air pollution, Water pollution control, Surries, Costs.
Identifiers: New Kathleen mine (Ill), Mineral wastes, Acid formation rate, *Refuse piles, *Slurry ponds.

Acid runoff from refuse piles can be controlled by covering the mineral wastes with soil, establishing a vegetative cover, and providing adequate drainage to minimize erosion. The average acid formation rate for the entire restored refuse pile was estimated at 16 lb acid as CaCO3/acre/day, or a reduction of 91+% when compared to the original unrestored pile. No significant differences were observed in acid formation rates from the 3 individual test plots covered with a nominal 1 foot, 2 feet, or 3 feet of soil. However, it was more difficult to physically place 1 foot of soil, especially on the steeper slopes. Slurry lagoons containing the fine coal rejects can be stabilized and the air pollution problem controlled by either a vegetative cover established directly on the mineral wastes without soil or by the application of a chemical stabilizer. Chemical stabilization is only a temporary measure, and vegetative covers should be the permanent solution to slurry lagoons. Cost data from this project indicate that it would cost approximately $6,100, $8,000, and $9,800 per acre to cover with grass a refuse pile with one, two, and three feet of soil respectively. (EPA)
W73-12516

STREAM QUALITY PRESERVATION THROUGH PLANNED URBAN DEVELOPMENT,
Regional Science Research Inst., Philadelphia, Pa.
R. E. Coughlin, and T. R. Hammer.
Copy available from GPO Sup Doc as EP1.23/3 73-019, $2.60; microfiche from NTIS as PB-222 177, $1.45. Environmental Protection Agency, Socioeconomic Studies Series Report, EPA-R5-73-019, May 1973. 227 p, 17 fig, 46 tab, 66 ref. EPA Project 16110 DYX.

Descriptors: Appraisals, *City planning, Flood plain zoning, Regional analysis, Intangible benefits, *Land appraisals, Water quality, *Land use, *Urban areas, Environmental effects, Channel improvement.
Identifiers: Land use controls, Runoff pollution, Preference analysis, *Open spaces, Stream quality preservation.

The effects of a land use plan to restrict urban development in areas critical to the water resource system are identified through empirical studies. Specifically, relationships are established between amount, density, type, and location of urban development, on the one hand, and stream water quality and stream channel enlargement on the other. The amount of open space with such a plan as compared to that with normal development is determined. Perception of water quality by untrained observers in the field and its relationship to overall site preference is studied and pilot studies are reported concerning the preferences of a sample of observers for various landscape characteristics. The evaluation of these effects is approached through household surveys designed to determine how use of and preference for stream sites is related to water quality of stream and distance of residence from stream. In addition, the effect of preserved open space on adjacent land values is explored empirically. (EPA)
W73-12518

THE PROBLEM OF COLOR MEASUREMENT FOR PULP MANUFACTURING EFFLUENTS (LE PROBLEME DE LA MESURE DE COULEUR DES EFFLUENTS DE FABRICATION DES PATES),
Centre Technique de l'Industrie des Papeirs, Cartons et Celluloses, Grenoble (France).
C. Pierre, and D. Monzie.
ATIP Revue, Vol 26, No 2, p 115-120, 1972. 4 fig, 2 tab, 9 ref. (Association Technique de l'Industrie Papetiere).

Descriptors: *Pulp wastes, *Bleaching wastes, *Color, Colorimetry, Effluents, Testing procedures, Measurement, Foreign research, Pulp and paper industry, Europe.
Identifiers: Bleach plants, France.

A critical multilaboratory study was conducted of various reported methods for measuring the color of pulp mill and bleach plant effluents. The platinum-cobalt method of A. Hazen, originally published in 1892, is recommended with certain modifications as being better adaptable to the needs of the paper industry than is the tristimulus method developed in 1966 by the American Public Health Association. (Wise-IPC)
W73-12526

ONTARIO UNHAPPY WITH EFFORTS OF INDUSTRY TO HALT POLLUTION,
R. Starks.
Canadian Pulp and Paper Industry, Vol 25, No 3, p 13-15, March 1972. 3 fig.

Descriptors: *Law enforcement, *Pulp and paper industry, *Canada, *Pollution abatement, Water quality standards, Water pollution control, Air pollution, Legal aspects, Water law, Governments, State governments.
Identifiers: *Ontario.

In contrast with the progress made in air pollution control by the Ontario pulp and paper industry, the slow rate at which the province's pulp and paper mills are fighting water pollution is causing grave concern to the Ontario Water Resources Commission (OWRC). Existing pollution control installations are deemed inadequate, and further pressure by OWRC should be expected. Legal action has commenced against companies that have not yet complied with the government's water quality regulations. (Witt-IPC)
W73-12538

OPTIMUM CONDITIONS FOR THE DISCHARGE OF PAPER INDUSTRY EFFLUENTS (OPTIMAL'NOE VODOOTVEDENIE STOKOV BUMAZHNOGO PROIZVODSTVA),
Leningradskii Tekhnologicheskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti (USSR).
A. I. Shishkin, B. D. Korol'kov, and V. F. Maksimov.
Bumazhnaya Promyshlennost, No 4, p 14-15, April, 1972. 2 fig.

Descriptors: *Water pollution sources, *Industrial wastes, Streams, Rivers, Running waters, Pulp wastes, Textiles, Water quality, Water pollution, Waste waters (Pollution), Dissolved oxygen, Biochemical oxygen demand, Water analysis, Foreign countries, Settling basins, Discharge lines, Discharge (Water), Effluents, Surveys, Seasonal, Suspended solids, Self-purification, Waste dilution, Flow characteristics.
Identifiers: *Nara River (USSR).

A 1 km long stretch of the Nara River was surveyed in order to assess pollution loads contributed by the Serpukhov Paper Mill and by a synthetic textile fiber factory, as well as the seasonal self-purification capacity of the stream. Effluents were analyzed for discharge volumes, flow rates, chemical composition, and physical characteristics, as well as for downstream dilution. Dissolved oxygen did not vary greatly with flow rate, water temperature, or season, whereas the suspended solids content showed wide seasonal variations. The BOD was the most significant indicator of water quality and of self-purification. According to this criterion, the greatest source of pollution (37%) was the effluent from the horizontal sedimentation tank of the paper mill, followed by its second discharge outlet (29%) and by one of the textile factor's discharge pipes (22%). (Stapinski-IPC)
W73-12547

RIVER THAMES ANTIPOLLUTION: BOARD-MAKERS INSTALL WORLD'S LARGEST TIDAL RIVER SURFACE AERATOR.

World's Paper Trade Review, Vol 177, No 9, p 282-283, March 2, 1972. 1 fig.

Descriptors: Rivers, *Pulp wastes, *Aeration, Equipment, Tidal streams, Oxygenation, Biochemical oxygen demand, Waste water treatment, Pollution control, *Pollution control treatment, Pulp and paper industry, Surface waters, Running waters, Water quality control, Waste waters (Pollution), Port Authorities.
Identifiers: *Board mills, *Thames River (U.K.), *Aerators, United Kingdom.

In cooperation with the Port of London Authority, a large 200-hp surface aerator has been installed by Thames Board Mills, Ltd. near Purfleet to replenish the oxygen supply of the Thames River in amounts equivalent to the biochemical oxygen demand of the board mill effluent discharged. A second larger aerator of 300-hp capacity is also planned. (Witt-IPC)
W73-12548

AERATION OF THE THAMES.

Compressed Air, Vol 77, No 5, p 12, (1972).

Descriptors: *Aeration, Rivers, *Pulp wastes, Equipment, Oxygen demand, Effluents, Treatment facilities, Water quality control, Waste waters (Pollution), Waste water treatment, *Pollution control treatment, Pollutants, Pollution control, Running waters, Surface waters, Pulp and paper industry, Tidal streams, Oxygenation.
Identifiers: *Thames River (U.K.), *Board mills, United Kingdom, *Aerators.

At Purfleet, England, Thames Board Mills, Ltd. installed a 200-hp surface aerator in the River Thames to compensate for the oxygen demands made on the stream by the discharged mill effluents. A second aerator of 300-hp capacity is planned. (Witt-IPC)
W73-12549

LARGE SURFACE AERATOR DESIGNED TO CONDITION BOARD MILL EFFLUENT.

Boxboard Containers, Vol 79, No 9, p 28, April, 1972. 2 fig.

Descriptors: Rivers, *Pulp wastes, *Aeration, Equipment, Tidal streams, Oxygenation, Biochemical oxygen demand, Surface waters, Pulp and paper industry, Effluents, Waste water treatment, Pollution control, *Pollution control treatment, Running waters, Waste waters (Pollution), Water quality control.
Identifiers: *Board mills, *Thames River (U.K.), *Aerators, United Kingdom.

A 'Simplex' cone aerator constructed by Ames Crosta Mills and Co. Ltd., Heywood, England, powered by a 200-hp motor, plus a second planned larger aerator of 300 hp, will permit the oxygen-consuming effluent load discharged by Thames Board Mills Ltd. to be fully compensated by reoxygenation of the Thames River. The 200-hp aerator is rated capable of dissolving 2.5 lb of oxygen per kw-hr. (Witt-IPC)
W73-12550

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. I. GENERAL AND IN-PLANT MODIFICATIONS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12553

CALIFORNIA POWER PLANT SITING STUDY: VOLUMES, I, II, AND III.
Holmes and Narver, Inc., Anaheim, Calif.

Contract Report HN-8145.3-.5 (UC-12), May 1973. 466 p, 72 fig, 45 plate, 52 tab, 309 ref, 4 append.

Descriptors: *Powerplants, *California, *Environmental engineering, Nuclear powerplants, Underground powerplants, *Environmental effects, Social aspects, Thermal pollution, Water pollution control.
Identifiers: Offshore powerplants.

The concept of locating powerplants inland ranks highest in overall acceptability and would utilize land of greatest abundance in California. The concept consistently ranks high in acceptability when compared with other concepts against only cost, environmental impact, feasibility, or risk individually. Underground locations are not competitive with the acceptability of aboveground plants; but if they are preferred for aesthetics or for any of the other factors studied, the most favorable is one located in a cut-and-cover situation in nonmassive or poorly cemented materials. Offshore locations are not competitive with the acceptability of aboveground plants. The floating plant in a vessel located in deep water is more acceptable than the other offshore concepts because of its lower cost and the length of coastline where deep water exists. (Knapp-USGS)
W73-12574

ENVIRONMENTAL IMPACT STUDY.
Ocean and Atmospheric Science, Inc., Dobbs Ferry, N.Y.

Available from NTIS, Springfield, Virginia 22151, as AD-754 458 Price $10.60 printed copy; $1.45 microfiche. Final Technical Report 72-116, November 1972. 418 p, 7 fig, 22 tab, 15 ref, 6 append. ONR N00014-72-C-0425.

Descriptors: *Environmental control, *Pollution abatement, *Pollutant identification, *Water pollution sources, Air pollution, Analytical techniques, Instrumentation, Laboratory tests, On-site investigations, Mass - spectrometry, Polarographic analysis, Electrodes, Chromatography, Federal government, State governments, Administrative agencies.

The Advance Research Projects Agency (ARPA) Environmental Impact Program is directed toward identifying those scientific and technical areas necessary to achieve satisfactory evaluation and abatement of the environmental impacts of Department of Defense (DoD) activities. The effort is directed toward high technology problems for which there are current voids not being adequately addressed by others and for which the environmental evaluations require considerable interservice and interagency participation. Several areas were identified and appear to be germaine for additional efforts by DoD and ARPA. These include: sensors and instrumentation, critical materials, environmental impact prediction facility, model base, and environmental management. (Woodard-USGS)
W73-12580

REPORT TO THE FEDERAL WORKING GROUP ON PEST MANAGEMENT FROM THE TASK GROUP ON CATEGORIZATION OF PESTICIDES USED BY THE FEDERAL GOVERNMENT.
Federal Working Group on Pest Management, Rockville, Md.

Available from NTIS, Springfield, Va. 22151 as PB-214 385 - Price $3.00 printed copy; $1.45 microfiche. Report-72-1, September 1972. 36 p, 2 append.

Descriptors: *Pesticides, *Pest control, *Federal Government, Water pollution control, Acaricides, Fumigants, Fungicides, Herbicides, Insecticides, Molluscicides, Piscicides, Rodenticides, Pollutant identification.
Identifiers: *Pesticides categorization, Federal pest control programs, Pest management.

The report is designed for use of federal agencies which require the use of pesticides. The intent is to tie pesticide usage with the proper training of personnel using pesticides and appropriate professional review of pest management programs. The report is to be used in conjunction with the report to the Working Group from the Task Group on Training Objectives and Standards (FWGPM-72-2). Both reports are applicable to federal pest management programs only and are not intended as guidelines for public regulatory agencies or for regulatory decisions. Categorization is presented for 184 pesticides used by the federal government during 1970, 1971, and 1972. The four categories are described. Criteria used for the categorization as well as the levels of required training and review for each category are also presented. (Woodard-USGS)
W73-12598

HEALTH STANDARDS FOR METALS IN DRINKING WATER,
National Environmental Research Center, Cincinnati, Ohio.
R. G. Tardiff.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institution Report SEMN WR 016.73, p 113-139, January 1973. 10 fig, 2 tab, 10 ref.

Descriptors: *Water quality standards, *Potable water, *Public health, *Water pollution effects, *Heavy metals, Water Quality Act, Water pollution control, Water quality control, Industrial wastes, Municipal wastes, Pesticides, Toxicity, Regulation, Water policy, Water properties, Trace elements, Federal Government.

The evaluation of hazards from chemicals in drinking water and the setting of standards for these compounds are under the legal jurisdiction of the Environmental Protection Agency. The actual development of standards for these agents is directed by the Office of Water Programs with assistance of experts both inside and outside of the Agency. The National Environmental Research Center of Cincinnati, Ohio, is the focal point for EPA-directed research on the health aspects of chemicals in drinking water. The standards presently in force for chemicals in potable water were promulgated by the U.S. Public Health Service in 1962. These standards are listed and are compared with the proposed standards as revised by the Environmental Protection Agency. In discussing the biologic data which must be evaluated to set standards, and in emphasizing the necessity of current research, mercury and its

derivatives are used as examples. (See also W73-12604) (WoodarddUSGS)
W73-12610

NUTRIENTS IN NEBRASKA'S WATERS,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W73-12615

FOULING ON EELGRASS (ZOSTERA MARINA L.),
Rhode Island Univ., Kingston. Graduate School of Oceanography.
J. McN. Sieburth, and C. D. Thomas.
Journal of Phycology, Vol 9, No 1, p 46-50, March 1973. 3 fig, 12 ref.

Descriptors: *Fouling, Diatoms, Marsh plants, Marine microorganisms, Marine plants, Marine algae, Chrysophyta, Electron microscopy, Salt marshes, Sampling, Rhodophyta, Fungi, Cyanophyta, Scuba diving, Marine bacteria.
Identifiers: *Cocconeis scutellum, Zoestera marina, *Colonization, *Eelgrass, Scanning electron microsopy, Macrophytes, Sample preparation, Spirulina.

The heavily fouled, immersed part of the blade, and the emersed portion of the blade undergoing fouling from mature, first-year plants collected by SCUBA from a brackish marsh were examined by scanning electron microscopy. The surface of young shoots emerging in the spring and the surface of mature blade tips immersed in the fall when examined at 500 to 2000x have a minimal scattering of coccoid and filamentous bacteria which are relatively insignificant in comparison to the colonization by pennate diatoms. Broken frustules and detritus adhere to form a crust which then becomes colonized nonselectively by a variety of microorganisms (stalked and colonial diatoms, filaments of red alga, a blue-green alga (Spirulina), a bacterium, and mycelia and sporangia of a fungus). Removal of the crust shows that the original 'cobblestone' surface of the eelgrass is obscured with a layer of deformed cells of Cocconeis scutellum which appears to be impressed into the epithelium. (Holoman-Battelle)
W73-12631

THE QUALITY OF DRAINAGE WATER FROM IRRIGATED BLACK COTTON SOILS FOR IRRIGATION,
University of Agricultural Sciences, Siruguppa (India). Agricultural Research Station.
For primary bibliographic entry see Field 03F.
W73-12650

INDICATORS OF ENVIRONMENTAL QUALITY. PROCEEDINGS OF A SYMPOSIUM.

Philadelphia, Pa., Dec. 26-31, 1971. Plenum Press: New York, N.Y., London, England. 1972. W. A. Thomas, editor, 275 p, Map. Illus. Pr. $18.50.
Identifiers: Books, *Environmental quality, *Indicators, Plants, Pollution, Proceedings, Symposium.

Indicators and indices which measure variables and provide overall composite values for environmental shifts are examined, emphasizing the importance of developing a common denominator with which to assess the environment. The first group of papers covers the following topics: indicators of environmental quality; use of environmental indices in policy formulation; urban-environmental indicators in municipal and neighborhood policy planning and decision making; the obligation of the scientist to explain environment to the public; and evaluation of natural environments. The next group of papers covers the following topics: establishing priorities among environmental stresses; pollutant burdens in humans-a measure of environmental quality; aquatic communities as indices of pollution; plants as indicators of air quality; biochemical indicators of environmental pollution; and use of sense of smell in determining environmental quality. The final group of papers includes the following topics: outdoor recreational resources and land use shift; a water quality index; indices of air quality; statistically based air-quality indices; indicators of environmental noise; developing a soil quality index; environmental indices for radioactivity releases; and plant indicators in ecology.--Copyright 1973, Biological Abstracts, Inc.
W73-12654

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION I,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
J. B. Berkowitz, G. R. Schimke, and V. R. Valerie.
Available from GPO, Washington, D.C. 20402, Price: Sect 1 as (EP1.23/2:73-179b) $1.25, Sect 2 as (EP1.23/2:73-179c) $7.25, Sect 3 as (EP1.23/2:73-179d) $3.70, Microfiche from NTIS as PB-222 248, $1.45 each. Environmental Protection Technology Series Report EPA-R2-73-179b-d, April 1973 (3 vol). EPA Contract 68-01-0102.

Descriptors: *Water pollution sources, *Industrial production, *Industrial wastes, *Indexing, Chemicals, Pollutants, Toxicity, Oxygen demand, Bibliographies, Environmental effects, Color, Odor, Eutrophication, Hardness (Water), Reviews, Water pollution control.
Identifiers: Manufactured products.

Data on the pollution potential of manufactured products are compiled in a catalog of three sections. These data are required for pollution control and for enforcement of environmental quality standards. Section I contains summary data consisting of product name, production rate, product lifetime, toxicity, oxygen demand, solids, color, odor eutrophication, oils and tars, and water hardness. Section II is a product listing. It summarizes, for each product, the chemical compositions of the product. Section III consists of a list of chemical ingredients of products, a bibliography, toxicity data, and oxygen demand data. (Knapp-USGS)
W73-12671-1

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION II, PRODUCT LISTING,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
J. B. Berkowitz, G. R. Schimke, and V. R. Valerie.
Available from GPO, Washington, D.C. 20402, Price: Sect 1 as (EP1.23/2:73-179b) $1.25, Sect 2 as (EP1.23/2:73-179c) $7.25, Sect 3 as (EP1.23/2:73-179d) $3.70, Microfiche from NTIS as PB-222 249, $1.45. Environmental Protection Technology Series Report EPA-R2-73-179b-d, April 1973 (3 vol). EPA Contract 68-01-0102.

Descriptors: *Water pollution sources, *Industrial production, *Industrial wastes, *Indexing, Chemicals, Pollutants, Toxicity, Oxygen demand, Bibliographies, Environmental effects, Color, Odor, Eutrophication, Hardness (Water), Reviews, Water pollution control.
Identifiers: Manufactured products.

Data on the pollution potential of manufactured products are compiled in a catalog of three sections. These data are required for pollution control and for enforcement of environmental quality standards. Section I contains summary data consisting of product name, production rate, product lifetime, toxicity, oxygen demand, solids, color, odor, eutrophication, oils and tars, and water hardness. Section II is a product listing. It summarizes, for each product, the chemical compositions of the components of the product. Section III consists of a list of chemical ingredients of products, a bibliography, toxicity data, and oxygen demand data. (Knapp-USGS)
W73-12671-2

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION III, CHEMICAL INGREDIENT LISTING,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
J. B. Berkowitz, G. R. Schimke, and V. R. Valerie.
Available from GPO, Washington, D.C. 20401, Price: Sect 1 as (EP1.23/2:73-179b) $1.25, Sect 2 as (EP1.23/2:73-179c) $7.25, Sect 3 as (EP1.23/2:73-179d) $3.70, Microfiche from NTIS as PB-222 250, $1.45. Environmental Protection Technology Series Report EPA-R2-73-179b-d, April 1973 (3 vol). EPA Contract 68-01-0102.

Descriptors: *Water pollution sources, *Industrial production, *Industrial wastes, *Indexing, Chemicals, Pollutants, Toxicity, Oxygen demand, Bibliographies, Environmental effects, Color, Odor, Eutrophication, Hardness (Water), Reviews, Water pollution control.
Identifiers: Manufactured products.

Data on the pollution potential of manufactured products are compiled in a catalog of three sections. These data are required for pollution control and for enforcement of environmental quality standards. Section I contains summary data consisting of product name, production rate, product lifetime, toxicity, oxygen demand, solids, color, odor, eutrophication, oils and tars, and water hardness. Section II is a product listing. It summarizes, for each product, the chemical compositions of the components of the product. Section III consists of a list of chemical ingredients of products, a bibliography, toxicity data, and oxygen demand data. (Knapp-USGS)
W73-12671-3

PROBLEMS OF ENVIRONMENTAL ECONOMICS.
For primary bibliographic entry see Field 06B.
W73-12675

ANTI-POLLUTION POLICY AND COST ALLOCATION: THE ISSUES IN PRACTICE,
Padua Univ. (Italy).
For primary bibliographic entry see Field 06B.
W73-12677

NOTES ON INFORMATION AND ADMINISTRATIVE COSTS IN THE THEORY OF EXTERNALITIES,
Queen Mary Coll., London (England). Dept. of Economics.
For primary bibliographic entry see Field 06B.
W73-12678

PETER BOHM.
Handelshogskolan i Stockholm (Sweden).
For primary bibliographic entry see Field 06B.
W73-12680

SOME LIMITATIONS OF BENEFIT-COST ANALYSIS IN RESPECT OF PROGRAMMES WITH ENVIRONMENTAL CONSEQUENCES,
London Univ., (England). Dept. of Economics.
For primary bibliographic entry see Field 06B.
W73-12682

OUTLINE OF A MACRO-ECONOMIC ANALYSIS OF ENVIRONMENTAL POLLUTION: A MULTI-SECTORAL APPROACH,
Oslo Univ. (Norway). Inst. of Economics.
For primary bibliographic entry see Field 06B.
W73-12683

EVALUATION OF THE ECONOMIC EFFECTS OF ANTI-POLLUTION PUBLIC POLICY,
For primary bibliographic entry see Field 06B.
W73-12684

ECONOMIC EFFECTS OF TECHNOLOGY CHANGES IN RELATION TO THE ENVIRONMENT,
Bari Univ. (Italy). Instituto di Merceologia.
For primary bibliographic entry see Field 06B.
W73-12685

THE ROLE OF UNIFORM STANDARDS IN INTERNATIONAL ENVIRONMENTAL MANAGEMENT.
Maryland Univ., College Park. Coll. of Business and Public Administration.
For primary bibliographic entry see Field 06B.
W73-12686

ENVIRONMENTAL COST OF MINING,
Bureau of Mines, Washington, D.C.
James E. Gilley.
In: Proceedings of the Council of Economics, American Institute of Mining, Metallurgical, and Petroleum Engineers, March 1-4, 1971, New York, p 99-109. 1 tab, 14 ref.

Descriptors: *Pollution abatement, *Mining, *Environmental effects, Costs, Water pollution control, Land subsidence, Mine drainage, Land reclamation, Acid mine water, Spoil banks, *Cost analysis, Estimated costs, Applachian Mountain Region.
Identifiers: Underground mining, Tailings, Coal fires, Cost effectiveness, Surface mining.

The environmental effects of underground and surface mining, and mineral or solid fuel processing and costs of alternative remedies are identified. In mining operations surface subsidence results from maximal extraction in order to realize optimum profits and conserve mineral resources. Control of the more insidious social cost of fires in abandoned mines and in virgin coal deposits has been attempted on a cooperative basis. More costly pollution problems are acid water drainage and sedimentation which imposes high costs to water users and results in serious aesthetic degradation, diminished aquatic life, and a decline in waterbased recreational use. Control is not only costly, but of limited effectiveness. Costs of necessary rehabilitation range from $304 million for correcting stream pollution and adverse soil conditions to $1.2 billion for development of surface-mined lands for specialized uses. The accumulation of solid wastes associtated with resource processing is expected to continue at an accelerating rate as resource demands increase and the quality of remaining deposits declines. Research is being conducted to discover recycling methods for these wastes. (Weaver-Wisconsin)
W73-12687

ANTIPOLLUTION POLICIES, THEIR NATURE AND THEIR IMPACT ON CORPORATE PROFITS,
E. J. Stahr.
In: Economics of Pollution, New York University Press, New York, New York, p 81-136, 1971. 2 tab.

Descriptors: Economics, *Economic impact, *Environment, *Costs, Standards, Economic efficiency, *Pollution taxes (Charges), Industries, Cities, Effluents, Constraints, Water quality standards.
Identifiers: *Environmental pollution control, Antipollution charges, Economic incentives.

The problem of optimal environmental pollution control policy is generally discussed through consideration and criticism of public opinions and presentation of opinions following from economic principles. The nature of the pollution problem is shown to be one of 'ecosystem overload' due to increasing industrial production and world population, the introduction of 'exotic' materials into the environment, and the growing expectations of cleanliness, safety, and healthfulness by society. Antipollution policy should be based upon three principles: (1) elimination of polluting goods through technological change or social policy, (2) consideration of the economic efficiency of environmental programs, and (3) the establishment of environmental standards. The central conclusion suggests that economic incentives be introduced to pollution control programs. The impact of such policy on the domestic economy and international trade is generally discussed. The implications of the cost of environmental protection from pesticides is briefly reviewed. (Weaver-Wisconsin)
W73-12695

IDENTIFICATION AND ACHIEVEMENT OF ENVIRONMENTAL QUALITY LEVELS IN MANAGING THE USE OF NATURAL RESOURCES,
Iowa State Univ., Ames. Dept. of Economics.
J. F. Timmons.
Iowa Agriculture and Home Economics Experiment Station, Ames, Journal Paper No. J-7157, 1972. 29 p, 8 ref. OWRR B-015-IA (3)

Descriptors: *Water quality standards, *Management, *Cost transfer, Water policy, Decision making, Diseconomies of scale, Water reuse, Cost analysis, Methodology, Cost comparisons, Linear programming, Natural resources, Model studies, Cost allocations, Institutions.
Identifiers: *Environmental quality, *Least-cost analysis, *Next-use approach, Irreversible use.

Procedures for the identification, measurement, analysis, and achievement of environmental quality levels through natural resource management in the context of ecological, technological, and economic interrelationships are suggested. The next-use approach to the establishment of environmental quality levels given other social objectives was found preferable to the irreversibility approach. The next-use approach provided greater flexibility in the formulation of policy tailored for specific situations. Application of this approach is illustrated by two case studies in which least-cost estimates of achieving successively higher quality standards were obtained using linear programming. First-use effects on quality and next-use quality requirements were compared to derive the cost of alternative methods of raising the quality standards. Choice among these alternatives involves identifying the least-cost alternative given the provision of goods and services demanded by society. In addition, issues and possibilities involved with the achievement of a particular quality level in the context of various interrelated technological, economic and institutional considerations are briefly discusses. (Weaver-Wisconsin)
W73-12696

NOTE ON CHARGES AND BRIBES IN THE LONG RUN WITHIN WATERSHEDS,
Wyoming Univ., Laramie. Coll. of Commerce and Industry.
L. C. Maxwell.
Water Resources Research, Vol 8, No 5, p 1344-1346, 1972. 1 fig, 4 ref.

Descriptors: *Pollution abatement, *Pollution taxes (Charges), *Graphical analysis, Industries, Industrial wastes, Watersheds, Productivity, Economic efficiency, Economies of scale.
Identifiers: *Waste emission control, Long-run equilibrium.

How the impact of charges and bribes on long run levels of waste discharge and firm output for industries which are located in different watersheds and are characterized by increasing or decreasing costs was investigated. Kneese and Bower (1968) have demonstrated that the long run effect of charges and bribes was a symmetric reduction of waste emissions. The conclusion is that the impact of such charges and bribes is indeterminate. Based on the usual Marshallian conditions for long run equilibrium of firms and industries with the simplifying assumption that waste emission can be reduced only if the output of the firm is reduced, charges on waste emissions from a decreasing cost industry result in a decline in the production of both the representative firm and the industry; this impact is less severe in the case of a constant cost industry. The impact of such charges or bribes within any one watershed is indeterminate due to changes in emission which might occur in low damage watersheds, possible external resource price changes or insufficient a priori knowledge, as in the case in which abatement equipment is employed. (Weaver-Wisconsin)
W73-12702

CONSTRUCTION COSTS OF WATER SUPPLY AND SEWAGE NETWORKS IN POLAND--19-61-1970,
Institute of Public Utility Services, Warsaw (Poland).
For primary bibliographic entry see Field 06C.
W73-12703

A STUDY OF THE ECONOMIC IMPACT ON THE STEEL INDUSTRY OF THE COSTS OF MEETING FEDERAL AIR AND WATER POLLUTION ABATEMENT REQUIREMENTS. PART I - EXECUTIVE SUMMARY.

Available from the National Technical Information Service as PB-211 917, $3.00 in paper copy, $1.45 in microfiche. Council on Environmental Quality, Washington, D.C., July 1972. 16 p.

Descriptors: Costs, *Pollution abatement, *Cost analysis, *Economic impact, Financial feasibility, Air pollution, Water pollution control, Water quality standards, Industrial wastes, Pollution taxes (Charges).
Identifiers: *Steel industry, Capital expenditures, Foreign competition.

This volume summarizes findings and conclusions presented in Part II - The Structure of the Steel Industry and Part III - The Economic Impact of Pollution Abatement. The industry's output is highly concentrated among a small number of companies. Although demand for steel is highly sensitive to changes in the level of economic activity, steel prices have remained rigid in an upward direction. Lagging demand and increasing foreign competition have encouraged a breakdown in price leadership and increasing price shading. Stagnating demand resulted in falling profits which were stabilized in 1971 through price increases, improved productivity and management belt tightening. Voluntary restraint arrangements with foreign competitors have limited the increase of most types of steel imports. The potential impact of pollution abatement costs on the industry is dependent on many interacting and uncertain factors. However, subject to possible accelerated capital expenditures to replace plant and equipment which cannot be economically cleaned up, financing pollution abatement capital expenditures should be possible if the industry's profit performance parallels that projected in this study. (Weaver-Wisconsin)
W73-12707

IMPACT OF COSTS ASSOCIATED WITH NEW ENVIRONMENTAL STANDARDS UPON THE PETROLEUM REFINING INDUSTRY. PART I. THE IMPACT OF ENVIRONMENTAL CONTROL COSTS.
Sobotka (Stephen) and Co., New York.

Available from the National Technical Information Service as PB 207 199, $3.00 in paper copy, $1.45 in microfiche. Council on Environmental Quality, Washington, D.C. 59 p, November 1971. 2 tab., 9 exhibits.

Descriptors: *Pollution abatement, *Economic impact, *Oil industry, Costs, *Cost analysis, Cost trends, Financial feasibility, Capital costs, Construction costs, Equipment, Unemployment, Pricing, Effluents, Air pollution, Water quality standards, Industrial wastes, Pollution taxes (Charges).
Identifiers: *Refineries.

Analysis of cost and price effects of environmental pollution control bases upon cost data furnished by the Environmental Protection Agency leads to the following conclusions: Oil product price increases of about 8 cents per barrel resulting from installation and operation of new equipment and most importantly from substitution of low for high sulphur liquid refinery fuel. New control equipment will cost the industry $113 million. New control equipment installed in existing refineries has a higher cost per barrel of capacity than equipment installed during new refinery construction. Due to increasing demand, the absence of substitute products, and foreign competition, as well as a small price elasticity for most of the industry's products, the cost of control equipment will be substantially recovered through increased product prices. Refineries will be affected depending on their current effluent control facilities, size, and oil refining processes. Refineries below 25,000 barrels per day capacity may be unable to finance control facilities due to large control costs relative to their going concern value. These refineries account for less than 1% of industry capacity and employ less than 1,000 people. (Weaver-Wisconsin)
W73-12708

A DESCRIPTIVE ANALYSIS OF THE BAKERY PRODUCTS INDUSTRY DETAILING INDUSTRY TRENDS AND CHARACTERISTICS RELEVANT TO ECONOMIC IMPACT ANALYSIS OF ENVIRONMENTAL STANDARDS. PART II.
Ernst and Ernst, Washington, D.C.

Available from the National Technical Information Service as PB-207 170, $3.00 in paper copy, $1.45 in microfiche. Council on Environmental Quality, Washington, D.C. December 1971. 18 p, 3 fig., 4 tab.

Descriptors: *Economic impact, *Cost analysis, *Pollution abatement, Marketing, Industrial plants, Cost trends, Competition, Demand, Water quality standards, *Pollution taxes (Charges), Industrial wastes.
Identifiers: *Bakery industry, Industry trends, Industrial organization.

The structure, characteristics and trends of the bakery industry relevant to the economic analysis of the impact of pollution abatement costs are described. The market for bakery products and, thus, location of bakeries is a strict function of population and is subject to only insignificant variations due to regional preferences. Thus, cost increases associated with pollution abatement will be spread uniformly over regions, given uniform cost increases across all regions. The demand for bakery products has been highly inelastic. Despite a growing trend toward concentration in the bakery industry, there remain a large number of firms whose competitiveness has resulted in low profit margins. In addition, low-technology plants do not typically operate at a cost disadvantage. Thus, cost increase due to pollution abatement will have an unbiased impact on plants of various sizes. Government influence on supply of bakery products is minimal. There exists sufficient overcapacity to correct for possible losses in supply due to plants leaving the industry. (See also W73-12710) (Weaver-Wisconsin)
W73-12709

A STUDY OF THE IMPACT OF POLLUTION STANDARDS AND CHARGES ON THE BAKERY INDUSTRY. PART III.
Ernst and Ernst, Washington D.C.

Available from the National Technical Information Service as PB-207 171, $3.75, in paper copy, $1.45 in microfiche. Council on Environmental Quality, Washington, D.C. December 1971. 36 p, 3 tab, 2 append.

Descriptors: *Pollution abatement, *Economic impact, *Cost analysis, Industrial water, Industrial production, Cost trends, Financial feasibility, Water quality standards, *Pollution taxes (Charges), Industrial wastes.
Identifiers: *Bakery industry, Profit trends.

The preliminary findings of Part II of this study are amplified. The most relevant segmentation of the bakery industry is into (1) the bread, cake, and related products industry and (2) the biscuit and cracker industry. Within these two segments plants should be classified by size and amount of waste water discharged. Current trends in return on investment, employment, and concentration are expected to be unaffected by the small increases in cost due to pollution abatement activities. Using a cost model for pollution control in the bakery industry supplied by the Environmental Protection Agency, the probable impact of pollution control costs was found to be very insignificant. Annual abatement costs expected in the most expensive year (1976) were estimated by EPA to be $4.84 million. According to U.S. Department of Commerce data industry sales in 1976 are estimated as $9 billion. Thus, pollution abatement would raise costs .054 cents per dollar of sales, given current price trends. (See also W73-12709) (Weaver-Wisconsin)
W73-12710

MATHEMATICAL MODELING FOR ENVIRONMENTAL POLLUTION CONTROL,
Clemson Univ., S.C.
B. C. Dysart, III.
Seminar presented to: Southeast Water Laboratory, Environmental Protection Agency, Athens, Georgia, p 1-10, March 1972. 10 p, 1 fig. OWRR-B-017-SC (7).

Descriptors: *Water pollution control, *Environment, *Mathematical models, *Optimization, Value, Efficiency.
Identifiers: Accuracy.

There seems to be considerable hesitancy and reluctance on the part of many people to use optimization, for several reasons. Also, there are many who utilize it when it is a grossly inappropriate choice of tool for the problem at hand. These two groups do not average out for the benefit of pollution control. Some of the reasons people claim for their reluctance to use the technique are discussed. They include: (1) Instream transfer functions and process models are not accurate enough to use with reliability--optimization techniques cannot be trusted in this sort of problem solving; (2) the problem or system is too complex to model; (3) since the chances of implementing an optimal policy are slim, why bother to find one; (4) the use of optimization results in too much dependence upon economics and not enough consideration for the pragmatic aspects of how to deal with the problem; and (5) common optimization techniques are not adequate when dealing with large systems with great precision and consideration of minute details. Optimization can be advantageous as tools for guiding planners in water resources development, but professionals must decide realistically just what they want from mathematical modeling in general. (Bell-Cornell)
W73-12711

EVALUATION OF HERBICIDES FOR SUBMERGED WEEDS IN CHAMBAL AND BHAKRA-NANGAL CANAL SYSTEMS,
Indian Grassland and Fodder Research Inst., Jhansi. Div. of Weed Ecology Control.
T. R. Dutta, J. Prasad, and R. P. Singh.
Indian J Agric Sci. Vol 42, No 1, p 70-75. 1972.
Identifiers: *Aquatic weed control, Berseem, Canals, Ceratophyllum-Demersum, Chara-Vulgaris, Chlorothiamid, Coriander, Diuron, Endothal, Esters, *Herbicides, Hydrilla-Verticillata, *India, Linseed, Mustard, Najas-Minor, Potamogeton-Crispus, Potamogeton-Nodosus, Potamogeton-Pectinatus, Potamogeton-Perfoliatus, Rice, Vallisneria-Spiralis, Weeds, Wheat, Xylene.

Chlorothiamid, endothal (dipotassium and alkylamine), 2.4-D butoxyethanol ester, diuron and xylene were screened in situ on 25-m lengths of channels heavily infested with weeds at Kota and Jyotisar. The discharge capacity of these channels were seriously hampered by growth of Potamogeton perfoliatus L., P. pectinatus L., P. nodosus Poir., P. crispus L., Chara vulgaris Vals, Najas minor Rend., Hydrilla verticillata (L. f.) Royle, Ceratophyllum demersum L. and Vallisneria spiralis L. The experiments were conducted in both slow-flowing and stationary channels. Chlorothiamid, endothal and 2,4-D completely killed all the submerged weeds. The herbicides were more effective in stagnant than in flowing water. The treated water was found safe for linseed, mustard, gram, berseem, coriander, wheat and rice, which are the common crops of these regions. The herbicide-treated water was non-toxic for mammalian consumption.--Copyright 1973, Biological Abstracts, Inc.
W73-12738

EFFECTS OF PESTICIDES IN WATER--A REPORT TO THE STATES.
Environmental Protection Agency, Washington, D.C.

Available from the National Technical Information Service as PB-222 320, $5.75 in paper copy, $1.45 in microfiche. (1972). 85 p, 2 tab, 52 ref, append.

Descriptors: *Pesticides, *Water pollution effects, *Water pollution control, *Federal Water Pollution Control Act, State governments, Environmental effects, Economic impact, Social aspects, Pollution abatement, Watershed management, Water pollution sources, Reviews, Evaluation.

Current knowledge is presented of the effects on health and welfare of the presence of pesticides in water. This document is to serve as a guide to the States in carrying out the Federal Water Pollution Control Act. Some of the more important considerations are: the nature of the environmental effect of the presence of pesticides in water (e.g., long or short term, temporary or permanent, localized or widespread, etc.); the economic and social impact of the control measure, including both impact associated with restricting use of pesticides, and the impact of the environmental damage to be alleviated; the practicality and enforceability of the control measure, including the availability of techniques and instrumentation for determining whether particular standards are being met; and the availability of other control measures for meeting the objectives, and the relationship to and consistency of the control measure with policy and action under other programs. (Woodard-USGS)
W73-12752

ANNOTATED BIBLIOGRAPHY OF LAKE ONTARIO LIMNOLOGICAL AND RELATED STUDIES - VOL 1 - CHEMISTRY,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
For primary bibliographic entry see Field 02H.
W73-12753

ANNOTATED BIBLIOGRAPHY OF LAKE ONTARIO LIMNOLOGICAL AND RELATED STUDIES - VOL II - BIOLOGY,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
For primary bibliographic entry see Field 02H.
W73-12754

CORROSION BY THE SULPHATE-REDUCING BACTERIA,
University of Manchester Inst. of Science and Technology (England). Dept. of Chemical Engineering.
R. A. King, and J. D. A. Miller.
Nature, Vol 233, No 5320, p 491-492, October 15, 1971. 2 fig, 1 tab, 13 ref.

Descriptors: *Corrosion, Cathodic protection, *Chemical reactions, *Sulfer bacteria, Anaerobic bacteria.
Identifiers: *Cathodic depolarization, Anodic reaction, *Corrosion cell, Oxygen-free conditions.

There are several explanations for the aggravation of corrosion of iron and steel in oxygen-free conditions by sulfate-reducing bacteria. These are (a) stimulation of the cathodic part of the corrosion cell by the removal and utilization of the polarizing hydrogen by the bacteria, (b) stimulation of the cathodic reaction by solid ferrous sulphides formed by the reaction of ferrous ions with sulphide ions produced by bacteria, (c) stimulation of the anodic reaction, metal dissolution, by bacterially produced sulphide, (d) local acid cell formation and (e) formation of iron phosphide by the reaction of the metal with bacterially reduced phosphates. A new theory of corrosion by the sulphate-reducing bacteria is proposed such that the cathodic reaction, hydrogren evolution, occurs on the ferrous sulphide produced by the reaction of ferrous ion with bacterially produced sulphide ion. The ferrous sulphide activity is diminished with time, but is restored by removal of the atomic hydrogen by bacterial hydrogenase activity. (Campbell-NWWA)
W73-12756

ENCOURAGE APPLIED RESEARCH AND PUBLISH THE FINDINGS,
Minnesota Mining and Mfg. Co., St. Paul.
J. T. Ling.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 92, No SA4, p 1-5, August 1966.

Descriptors: *Sanitary engineering, Waste water, Technology, *Engineering education, On-site investigations, Projects.
Identifiers: *Applied research, Federal Water Quality Act.

A number of engineers have indicated that most sanitary engineering research papers now being published are too 'academic'; findings cannot be directly applied to solve field engineering problems. In order to bridge this gap and provide a more balanced program that serves the academician as well as the field engineer, the scope of research must be enlarge to include more applied research. Due to the Federal Water Quality Act, information that can be used to solve various sanitary engineering problems is needed more than ever before; results obtained from applied research through the study of existing installations represent one of the best sources to fill this demand. Feasible means, such as the presentation of papers at national conferences, reimbursed if possible, are needed to encourage engineers, consulting firms, municipalities and various control agencies to participate in research and publish their findings. (Campbell-NWWA)
W73-12758

CATHODIC PROTECTION FOR COATED STEEL PIPELINES,
Colorado Springs Dept. of Public Works, Colo. Water Div.
For primary bibliographic entry see Field 08G.
W73-12765

CORROSION MONITORING METHOD REDUCES EFFECT OF VARIABLES IN ANALYZING OIL FIELD WATERS,
Texaco, Inc., Bellaire, Tex. Bellaire Research Labs.
For primary bibliographic entry see Field 08G.
W73-12767

PITLESS UNITS AND ADAPTERS,
Environmental Protection Agency, Washington, D.C. Div. of Water Supply.
For primary bibliographic entry see Field 08G.
W73-12776

THE DESIGN AND OPERATION OF DEEP--WELL DISPOSAL SYSTEM,
Chemstrand Corp., Pensacola, Fla. Utilities Assistance Group.
For primary bibliographic entry see Field 05E.
W73-12780

ECOLOGICAL INFORMATION ON THE DIFFERENCES IN THE NUMBER OF CULEX TRITAENIORHYNCHUS LARVAE AMONG PADDY FIELDS (IN JAPANESE),
Osaka Prefecture Inst. of Public Health (Japan).
For primary bibliographic entry see Field 03F.
W73-12829

ANNUAL LITERATURE REVIEW: ADMINISTRATION, SYSTEMS ANALYSIS,
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
D. P. Loucks.
Journal Water Pollution Control Federation, Annual Literature Review, Vol 45, No 6, p 1407-1414, June, 1973. 98 ref.

Descriptors: *Water pollution control, Waste water treatment, *Systems analysis, *Planning, *Decision making, *Management, Water quality, Simulation analysis, Optimization, Dynamic programming, Linear programming, Bibliographies, *Reviews.

The 1972 literature on the development and application of systems analysis techniques for defining and evaluating alternative water pollution control policies can be divided into state-of-the-art reviews, methodological studies, and applications of mathematical models to river, lake, or estuarine water quality control problems, to the analysis and design of sewer systems and waste water treatment facilities, and to particular problems in thermal pollution and industrial and agricultural effluent control. Forty-four such documents (books, articles, and reports) pertinent to the field of waste water treatment and water pollution control are summarized. The writings include a broad spectrum of mathematical modeling techniques, such as simulation analysis, linear and dynamic programming, and other optimization methods, to estimate feasible and often least-cost design and management alternatives for water quality planning. (Bell-Cornell)
W73-12840

WPCF PROJECT REPORT: A STATE CERTIFICATION PROGRAM GUIDE,
Water Pollution Control Federation, Washington, D.C.
L. L. Guy, Jr., G. W. Burke, Jr., and C. W. Brinck.
Journal Water Pollution Control Federation, Vol 45, No 5, p 787-808, May 1973. 1 tab, 4 ref.

Descriptors: *Waste water treatment, *Administration, *Personnel, *Training, Operations, Classification, Educatior Regulation, Water quality control, Water pollution control.
Identifiers: *Certification programs, Examination, Certification renewals, Certification criteria.

A study was conducted, supported by an EPA grant, of state programs for certification of operations personnel in wastewater facilities. Six states were visited and the others polled for facts and opinions on key issues. The project report included the findings and conclusions of the study and recommended actions for federal and state agencies. A 'State Certification Program Guide' is presented that attempts to describe the elements of an effective state program. The states are encouraged to coordinate their efforts, and particular attention is directed toward (a) adequate autonomy and budget, (b) separate certification from training, (c) broader coverage of personnel and facilities, (d) development of a sound classification system, (e) separate certification for industrial waste facilities, and (f) easier reciprocity among state programs. (Mortland-Battelle)
W73-12842

APPLICATION OF LIQUID CHROMATOGRAPHY TO POLLUTION ABATEMENT STUDIES OF MUNITION WASTES,
Army Natick Labs., Mass. Pioneering Research Lab.
For primary bibliographic entry see Field 05A.
W73-12877

PROPOSED OIL POLLUTION REGULATIONS, (FINAL ENVIRONMENTAL STATEMENT).
Coast Guard, Washington, D.C. Marine Environmental Protection Div.

Available from NTIS, Springfield, Va. 22151 as EIS-AA-73-0279-F - Price $3.00 printed copy; $1.45 microfiche. February 1973. 22 p.

Descriptors: *Coast Guard regulations, *Oil spills, *Oil industry, *Water pollution control, *Navigable waters, Navigation, Legal aspects, Transportation, Ships, Boats, Barges, Harbors, Inland waterways, Environmental control.
Identifiers: Transfer of oil, Environmental Impact Statements.

The U.S. Coast Guard, acting under the authority of the Federal Water Pollution Control Act, presents regulations governing the design, construction, and operation of vessels operating in the navigable waters and contiguous zone of the United States, and governing the design, construction, and operation of onshore and offshore facilities engaged in the transfer of oil in bulk (more than 250 barrels) to and from vessels. The purpose of these regulations is to reduce the probability of an accidental discharge of oil or oily wastes to or from vessels, or as a result of certain vessel accidents of limited energy. (Woodard-USGS)
W73-12955

MULTIPLE-USE PROBLEMS IN THE GREAT LAKES.
For primary bibliographic entry see Field 06B.
W73-12960

THE PLANNING VIEWPOINT,
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 06B.
W73-12964

AN INDUSTRIAL POINT OF VIEW-1970,
Wisconsin Electric Power Co., Milwaukee.
For primary bibliographic entry see Field 06B.
W73-12965

FLUORIDATION OR FLUORIDE SUPPLEMENTS: A STATEMENT BY THE NUTRITION

COMMITTEE, CANADIAN PAEDIATRIC SOCIETY.

Can Med Assoc J. Vol 106, No 2, p 150-153. 1972.
Identifiers: *Canada, *Fluoridation, Fluoride supplements, Human nutrition, Pediatric society, Water supply, *Potable water.

The following are recommended: all Canadian municipal water supplies should be adjusted to contain 0.7-1.0 ppm fluoride; where water supplies contain less than 0.5 ppm fluoride, fluoride supplements should be used, in conjunction with an education program to promote their regular use by all children under the age of 14; where water supplies contain more the 0.7 ppm fluoride, fluoride supplements should not be recommended.--Copyright 1973, Biological Abstracts, Inc.
W73-12990

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

SYSTEMS APPROACH TO METROPOLITAN AND REGIONAL AREA WATER AND SEWER PLANNING,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
G. W. Reid, and R. T. Alguire.
Available from the National Technical Information Service as PB-222 262, $6.00 in paper copy, $1.45 in microfiche. University of Oklahoma Research Institute Final Report, 1973, 401 p, 20 fig, 33 tab, 31 ref, 4 append. OWRR C-3263 (No 3709) (1).

Descriptors: *Systems analysis, *Cities, *Regional analysis, *Water distribution (Applied), *Sewers, *Planning, Land use, Demand, Network design, Model studies, Computer models, Cost analysis, Census, Human population, Water demand, *Oklahoma.

The objective was to provide the average planning group with a usable tool that would impart a systematic procedure for analyzing the water and sewerage networks of a regional metropolitan area. The framework derived for conducting this study was accomplished by the construction of six procedures which use three computer models: the inventory and data projection procedure which provides the input; the population model and procedure which generates the desirable alternatives in terms of people and their socio-economic characteristics; the land use procedure which allocates the output of the population model to an areal scheme; the demand model and procedure which produces the water demand and sewage output for the given areal scheme; the network model and procedure which optimizes on a least cost basis, while maximizing utilization of resources, the networks of water and sewerage to fulfill the alternatives available, and finally the plan procedures for the development of a continuing and comprehensive plan. The steps between each procedure have built-in planner intervention points, where the using group may 'game' new alternatives based on the results and data acquired from the previous procedure. The model was developed using data from the association of Central Oklahoma Governments.
W73-12351

CRITICAL REVIEW OF CURRENTLY AVAILABLE WATER QUALITY MODELS,
Hydrocomp, Inc., Palo Alto, Calif.
P. S. Lombardo.
Available from the National Technical Information Service as PB-222 265, $4.85 in paper copy, $1.45 in microfiche. Report, July 1973. 101 p., 5 fig., 5 tab, 62 ref, append. OWRR X-124 (No 3751) (1). OWRR 14-31-0001-3751.

Descriptors: *Water quality, *Model studies, *Reviews, Research priorities, *Simulation analysis, Management, Systems analysis, Input-output analysis, Data collections.

The state of the art of water quality modeling is reviewed and the six most comprehensive of the available models for simulating most water quality indices, including temperature, dissolved oxygen, BOD, nutrients, algae and zooplankton are evaluated. Models simulating only the DO-BOD relationship were considered to be inadequate for water quality management purposes and were not reviewed. Research needs for water quality model refinement are discussed. The importance of obtaining data adequate in quantity and detail for testing of models is stressed. Model application and analysis of model output are discussed. The Chen and Orlob model is felt to be the best present model for lake and estuarine analysis, and the Lombardo and Franz model appears to be the best available model for stream analysis.
W73-12352

MATHEMATICAL MODELS IN ECOLOGY, PROCEEDINGS OF THE 12TH SYMPOSIUM.
Grange-over-Sands, Lancashire, England, March 23-26, 1971. Blackwell Scientific Publications: Oxford, England; (Dist. in U.S.A. by F. A. Davis Co.). 1972. J. N. R. Jeffers, editor, 398 p, Illus. Map. Pr $21.00.
Identifiers: Books, *Ecology, *Mathematical models, Proceedings, Symposium, Computer models.

The papers presented represent the current state of the use of mathematical models in ecology and related sciences. The first group of papers cover the following topics: the challenge of mathematics to the ecologists; philosophical aspects of mathematical modelling in empirical science with special reference to ecology; developments in the Leslie matrix model; models and analysis of descriptive vegetation data; and theoretical models for large-scale vegetation survey. The next several papers cover the following topics: organization and management of an integrated ecological research program; building and testing ecosystem models; population models as a basis for pest control; an introduction to the analogue computer; parameter sensitivity and interdependence in hydrological models; and the use of computer simulation in conservation management. Papers are included on the following specific subjects: the simulation language as an aid to ecological modelling; stochastic model fitting by evolutionary operation; a field experiment, a small computer and model simulation; data management; and a discussion of the application of mathematical models to the assessment of the changes likely from the construction of an esturarine barrage. A section is included presenting a summary and assessment of the symposium from the point of view of a research director, an agricultural research scientist, a statistician and an ecologist. Numerous mathematical formulas are employed throughout, and each paper ends with a list of related references.--Copyright 1973, Biological Abstracts, Inc.
W73-12653

OUTLINE OF A MACRO-ECONOMIC ANALYSIS OF ENVIRONMENTAL POLLUTION: A MULTI-SECTORAL APPROACH,
Oslo Univ. (Norway). Inst. of Economics.
For primary bibliographic entry see Field 06B.
W73-12683

EVALUATION OF THE ECONOMIC EFFECTS OF ANTI-POLLUTION PUBLIC POLICY,
For primary bibliographic entry see Field 06B.
W73-12684

VALUATION OF TIMBER, FORAGE AND WATER FROM NATIONAL FOREST LANDS,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 06B.
W73-12701

MATHEMATICAL MODELING FOR ENVIRONMENTAL POLLUTION CONTROL,
Clemson Univ., S.C.
For primary bibliographic entry see Field 05G.
W73-12711

THE DEVELOPMENT OF A REGIONAL SYSTEMS ORIENTED WATER MANAGEMENT MODEL: A TOOL FOR POLICY ANALYSIS,
Case Western Reserve Univ., Cleveland, Ohio. Systems Research Center.
J. M. Richardson, Jr.
Technical Report, SRC Tech. Memo No 45, Rockefeller Paper-JMR-73-4, June 1, 1973. 33 p, 12 fig, 14 ref, 3 append.

Descriptors: *Water management (Applied), *Regional analysis, *Simulation analysis, *Planning, *Decision making, Water quality, *Political aspects, Water, Ecosystems, Phosphorous, Pollution abatement, Waste treatment, Governments, Computerprograms, Economics, Mathematical models, Systems analysis.

With the complexity of large social-technological-biological systems, the use of systems modeling and computer simulation techniques are believed to be necessary and highly potential for planning in the comprehensive field of water management. In order for a model to be useful to decision makers, it must meet two sets of potentially conflicting criteria: (a) Comprehensiveness and reliability; and (b) usability. Two submodels of a systems oriented regional water management model are discussed. The submodels, called PHIPAM (Phosphorus Interactive Policy Analysis Model) and IRRM (Institutional Regional Regulatory Model) are designed to simulate, respectively, an interactive decision stratum and the political aspects of local government planning and decision making in water management. They are specifically designed to strengthen the larger model of which they are a part in the problem areas of comprehensiveness and utility. PHIPAM and IRRM represent concrete attempts to bridge the gap between scientific validity and utility. With further development, it is hoped that they can contribute to the more effective utilization of systems models for policy analysis in the area of water management and elsewhere. (Bell-Cornell)
W73-12839

ANNUAL LITERATURE REVIEW: ADMINISTRATION, SYSTEMS ANALYSIS,
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05G.
W73-12840

6B. Evaluation Process

SYSTEMS APPROACH TO METROPOLITAN AND REGIONAL AREA WATER AND SEWER PLANNING,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 06A.
W73-12351

IDENTIFICATION OF WATER RESOURCES PLANNING PROBLEMS IN THE METROPOLITAN AREA OF GREATER SAN ANTONIO AND ITS ASSOCIATED COUNTIES,
Texas A and M Univ., College Station. Water Resources Inst.

J. K. Garner, and C. S. Shih.
Available from the National Technical Information Service as PB-221 182, $3.00 in paper copy, $1.45 in microfiche. Technical Report No 49, June 1973, 152 p, 41 fig, 12 tab, 135 ref. OWRR A-017-TEX (2). 14-31-0001-3844.

Descriptors: *Water resources development, *Planning, Reliability, *Texas, Cities, *Water quality control, Regional analysis.
Identifiers: San Antonio (Tex), San Antonio River Basin (Tex), Cibolo Creek (Tex), Balcones Escarpment (Tex), Edwards Plateau (Tex), Sensitivity.

The region incompassed by the San Antonio River Basin is described. Included is a brief summary of the regional economy, demography, and geographical characteristics. Additionally, quantitative information including the inventory and planning control for both surface and groundwater resource management of the San Antonio area is presented. Emphasis has been placed upon the identification of the probabilistic nature of regional water quality management. The methods and techniques developed for handling massive data and the reliability analysis for regional water quality control are also presented. (Runkles-Texas)
W73-12354

AN EVALUATION OF BALTIMORE HARBOR LAND USE POTENTIALS,
Regional Planning Council, Baltimore, Md.
M. L. Collin.
Available from the National Technical Information Service as BTL-RPC-BHLNVR-2-73. Prepared for Maryland Environmental Service, February 1973. 239 p, 34 fig, 8 tab, 4 append, 110 ref.

Descriptors: *Harbors, *Land use, Water quality, Environmental effects, *Urban renewal, Navigation, Aesthetics, Social aspects, Recreation, *Maryland, City planning.
Identifiers: *Baltimore Harbor, Optimal development, Compatible development, Ann Arundel County, Maryland, Baltimore City (Md), Maryland Port Authority, Charles Center - Inner Harbor Management, Army Corps of Engineers.

Baltimore Harbor has been an important commercial center for over 200 years. A concerted effort has been made by local planners, citizens, and governmental agencies to not only sustain the economic productivity of the Harbor but also to make the Harbor a more attractive and healthy setting for a wide range of activities and to help preserve various ecological processes. Land use on the shoreline of the Harbor is discussed. This includes discussions of the history of the Harbor area, existing land use patterns, effects of existing land uses on the water quality of the Harbor, and socio-economic trends in Harbor areas. Concepts of optimal harbor development and land use patterns are also discussed including suggested patterns for specific areas. Some features of optimal development include maximum public access to the water, compatible development of residential, recreational, and commercial land uses, redevelopment of deteriorating commercial and industrial areas, and a new lateral circulation pattern. (Elfers - North Carolina)
W73-12361

SURVEY OF WATER TRANSPORTATION POTENTIAL TO REDUCE CONGESTION AND POLLUTION IN WASHINGTON, D.C. AND OTHER MAJOR CITIES.
Lulejian and Associates, Inc., Falls Church, Va.
For primary bibliographic entry see Field 05G.
W73-12363

KAY COUNTY, OKLAHOMA, WATER AND SEWERAGE COMPREHENSIVE PLAN.
Evans and Nelson Engineering Co. and Associates, Ponca City, Okla.
For primary bibliographic entry see Field 05G.
W73-12364

FUNCTIONAL WATER AND SEWERAGE PLAN AND PROGRAM, PEE DEE REGION, SOUTH CAROLINA.
LBC and W Associates, Columbia, S.C.
For primary bibliographic entry see Field 05G.
W73-12365

TOWN OF CAIRO WASTE WATER REPORT.
Diachishn (A.) and Associates, New York.
For primary bibliographic entry see Field 05D.
W73-12366

REGIONAL UTILITIES STUDY: DRAINAGE VOLUME OF TECHNICAL APPENDIX.
Minges (James S.) and Associates, Inc., Farmington, Conn.
For primary bibliographic entry see Field 04A.
W73-12368

REGIONAL UTILITIES STUDY: SEWERAGE VOLUME OF TECHNICAL APPENDIX.
Minges (James S.) and Associates, Inc., Farmington, Conn.
For primary bibliographic entry see Field 05D.
W73-12369

SIXTEENTH ANNUAL ARIZONA WATERSHED SYMPOSIUM PROCEEDINGS.
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 04D.
W73-12403

THE VISUAL ASPECTS OF RESOURCE MANAGEMENT,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04D.
W73-12407

MEASURING PUBLIC RESPONSES TO VEGETATIVE MANAGEMENT,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04D.
W73-12408

HEURISTIC RANKING AND PRIORITIZING UNDER SUBJECTIVE CONDUCTIONS,
Bureau of Reclamation, Denver, Colo.
B. W. Paul.
Paper, ORSA, TIMS, AIEE Jt Natl Meet, Atlantic City, NJ, Nov 1972. 24 p.

Descriptors: *Project planning, *Decision making, *Priorities, Flood control, Economic justification, Economics, Project feasibility, Costs, Budgeting, Finance, Water quality, Recreation, Electric power production, Irrigation, Evaluation, Planning.
Identifiers: Environmental quality, Heuristic methods, Fish and wildlife, Criteria.

Annually the Bureau of Reclamation must decide which of some 150 potential planning projects should be identified for funding. A ranking or priority system is discussed by which the projects of different regions can be consistently evaluated and compared. Two side benefits are desired of the system: One is an audit trail of the decision process so that during Congressional hearings the reasons for choosing one project over another can be given; the other is a means of introducing and using new multiobjective planning (MOP) criteria. New Water Resource Council MOP standards require evaluation on a 4-account system; National Economic Development (NED), Regional Development (RD), Environmental Quality (EQ), and Quality of Life (QL). Results and analysis of system use are discussed. The system is shown to be a viable tool in analyzing projects for timely development. (USBR)
W73-12470

NEW TECHNIQUES FOR PARTICIPATIVE PLANNING IN WATER RESOURCES,
Colorado Univ., Boulder.
J. E. Flack.
Proc Int Symp Uncertainties Hydrol Water Resour Syst, Vol II, p 730-737, Univ Ariz, Tucson, Dec 1972. 11 ref.

Descriptors: *Planning, *Water resources, Economic efficiency, Public benefits, *Analytical techniques, Project planning, Economic justification, Statistical analysis, Environmental effects, *Decision making, Methodology.
Identifiers: Computer graphics, Alternatives, Public opinion, Policies, Statistical analysis.

A method is described that will permit selected participants in the decision-making process to exercise judgement, as contrasted with approval or disapproval, during the planning process. Major steps in this procedure are: (1) important attributes of technically complex issues surrounding water resources development are identified and defined in terms meaningful to laymen; (2) alternative water resource plans are evaluated; (3) through analysis of participants' evaluation judgments, alternative physical plans are developed; and (4) the final plan is recommended by a representative panel of citizens, agency officials, special-interest groups, and the engineer-planner. Analytical aids are provided to ensure that the recommendations of panel members are consistent with their best judgment as well as the judgment of the broader range of participants, and the technical and financial constraints of the system. Advantages of this process are that many interests become involved in the planning, several alternatives are developed, and decision making is structured to reduce disagreement and increase certainity of plan acceptance. (USBR)
W73-12472

MEASURING AND DEVELOPING METHODS OF ATTITUDE AND MOTIVATIONAL CHANGE IN IMPLEMENTING THE BIG BLUE RIVER BASIN WATER PLAN,
Doane Coll., Crete, Nebr.
E. J. McPartland.
Available from the National Technical Information Service as PB-222 274, $5.50 in paper copy, $1.45 in microfiche. 1973. 200 p, 54 tab, 45 ref, 7 append. OWRR-C-3160 (No 3696) (1). 14-31-0001-3696.

Descriptors: *Attitudes, *Behavior, *Motivation, Social aspects, Land management, Pollution abatement, Water quality, Recreation, Irrigation, Flood control, *Nebraska.
Identifiers: *Net attitude change, *Gross attitude change, Demographic characteristics, Survey research, Public opinion, *Big Blue River Basin water plan.

A series of public opinion surveys was used to determine what demographic factors were most related to people's attitudes toward water resources use, to discover public attitudes toward various issues concerned with water resources use, and to test and compare methods of communicating knowledge about water resources problems. The results indicated that higher incomes, more years of formal education, younger age groups, and town residence were more as-

sociated with positive attitudes toward water resources use than other variables. A close relationship to farming was less favorably associated with positive attitudes toward water resources use than any other demographic factor. Attitudes were generally positive toward proper farming methods, small watershed development, pollution abatement, and to a lesser extent for recreational development. Farmers opposed government regulation of farming practices, the construction of large flood control reservoirs in their area, and were divided over the issue of metering irrigation water. Informational sources pervaded by personal contact and inducing personal involvement were more closely associated with significant short-term attitude change than more impersonal informational sources such as newspapers.
W73-12491

A STUDY OF SELECTED ASPECTS OF RURAL WATER SYSTEM DEVELOPMENT IN MISSISSIPPI,
Mississippi State Univ., State College. Social Science Research Center.
P. J. Ross, R. N. Friery, and J. H. Peterson, Jr.
Available from the National Technical Information Service as PB-222 275, $3.50 in paper copy, $1.45 in microfiche. Mississippi Water Resources Research Institute Report, 1973. 53 p, 7 fig, 20 tab, 13 ref, 3 append. OWRR A-068-MISS (1).

Descriptors: Social aspects, *Rural sociology, Water supply, *Mississippi, Water resources development, *Rural areas, *Community development, Social change, *Regional analysis, *Regional development.

The major aims were to study patterns of the development of rural water systems in Mississippi and to examine major variables associated with patterns of rural water system development. Major findings included: (1) wide range of differences between water systems in terms of size, expansion, and racial composition of associated members, (2) distinct patterns of rural water systems development in the state following regional lines, and (3) slight to moderate associations between socioeconomic and demographic variables and rural water system development, though the differences in rural water systems development were not consistently or substantially explained by socioeconomic and demographic variables indicating that rural water system development is dependent on the interaction of many types of variables. (See also W73-12493)
W73-12492

ECONOMIC AND RELATED IMPACTS OF RURAL WATER SYSTEMS IN MISSISSIPPI,
University of Southern Mississippi, Hattiesburg. Bureau of Business Research.
B. M. Landry, C. P. Cartee, and D. C. Williams, Jr.
Available from the National Technical Information Service as PB-222 276, $3.50 in paper copy, $1.45 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Report July 1973. 67p, 1 fig, 8 tab, 12 ref, 5 append. OWRR-A-060-MISS (1).

Descriptors: Water supply, *Rural areas, *Economic impact, *Mississippi, Social aspects, Water resources development, *Community development, *Rural sociology, *Social change, *Regional analysis.

Construction and operation of rural community water systems in Mississippi have resulted in economic and related impacts. This study identified the impacted variables and quantified and qualified them as possible. Variables isolated for study included direct expenditures for construction and on-going expenditures related to operations and maintenance, land values, new housing construction, and commercial and industrial activity. Other variables studied included the change in the number of households lacking a water supply, system effects on households who could not afford individual wells, changes in the use of water-using household appliances, household improvements, and changes in water use per connection. In addition to the economic impact of the direct and on-going expenditures for the systems, each of the above variables was found to be impacted to varying degrees by the presence of the water system in the community. These are quantified and qualified based on a statewide survey of all systems. (See also W73-12492)
W73-12493

THE EFFECT OF PRICE AND OTHER SELECTED VARIABLES ON WATER CONSUMPTION,
Mississippi Univ., University. Bureau of Business and Economic Research.
K. W. Hollman, and W. J. Primeaux, Jr.
Available from the National Technical Information Service as PB-222 264, $3.00 in paper copy, $1.45 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Report, July 1973. 23 p, 5 tab, 4 ref. OWRR-A-064-MISS (1).

Descriptors: *Pricing, *Water utilization, Economics, Water conservation, *Water allocation (Policy), *Mississippi, Optimum development plans, *Regression analysis, Water demand, *Community development.

The objective was to isolate the impact of selected variables on water consumption. It is important to identify the determinants of water consumption so that vital managerial decisions can be facilitated. Given the variables which affect water utilization, public officials can manipulate prices and policies to help conserve water and to allocate water supplies in the optimum manner. Data from 14 cities in north Mississippi were used in the analysis. A multiple regression model was used to determine the specific impact of the variables. The principal conclusion of the analysis was that consumers are relatively unresponsive to price differences within the price ranges displayed in the study. These results indicate that price can be used effectively as a revenue raising device but is probably ineffective as a rationing device within the current range of prices. The number of residents per household was the primary determinant of water consumption levels per household. Other factors also had a small but significant explanatory effect. In general, the results reveal that communities able to forecast correctly their future population growth will be in an advantageous position with respect to future demands on their water systems.
W73-12495

STREAM QUALITY PRESERVATION THROUGH PLANNED URBAN DEVELOPMENT,
Regional Science Research Inst., Philadelphia, Pa.
For primary bibliographic entry see Field 05G.
W73-12518

PROBLEMS OF ENVIRONMENTAL ECONOMICS.

Organization for Economic Co-operation and Development seminar June-August 1971, Paris, France, 1972. 278 p. 20 fig, 17 tab, 9 ref. Price $5.50.

Descriptors: *Environment, *Pollution abatement, *Economic efficiency, *Economics, Analytical techniques, Cost-benefit analysis, Input-output analysis, Econometrics, Cost allocation, Foreign trade, Indicators, Decision making.
Identifiers: *Environmental pollution, Policies.

This volume consists of papers written for the seminar on environmental economics organized by the 'Central Analysis and Economic Evaluation Unit' of the Organization for Economic Co-operation and Development. Three selected subjects were discussed: (1) problems and instruments of environmental cost allocation; (2) methods of analysis and environmental indicators; and (3) international problems. Introductory papers investigated possible conflict between economic growth and environmental protection. The subject of allocation of environmental costs was treated in discussions of the economic efficiency of alternative environmental policies as based upon a study of the economic principles for internalizing external economics. Determination of environmental indicators was the area of principal interest in the discussion of methods of analysis. Two lines of approach studies were the approach by sectors, including benefit-cost analysis, and the integrated approach by input-output analysis, materials balance and econometric models. International problems studied were connected with the impact of environmental policy on international trade and 'trans-frontier pollution.' (See also W73-12676 and W73-12686) (Weaver-Wisconsin)
W73-12675

ENVIRONMENTAL POLICY ISSUES: REAL AND FICTITIOUS,
University Coll. London (England). Dept of Political Economy.
W. Beckerman.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 19-38. 2 fig.

Descriptors: *Welfare (Economics), *Environment, *Gross National product, *Pollution abatement, Quality control, Values, Costs, Optimization, Economics, Economic efficiency, Decision making.
Identifiers: *Environmental pollution, Economic growth, Policies, Value judgements, Economic conflicts, Pollution control.

The main economic aspects of environmental policy are surveyed in order to differentiate those which are particularly important in formulating practical policies concerning the environment as well as those relevant to the work of an international economic organization. Two general economic aspects of environmental policy are discussed: (1) the relationship of economic growth or development and the quality of the environment, and (2) the optimum composition of national output taking into account the effects of different components of output on the environment. A conflict does not automatically arise between economic growth and environmental protection; in fact, economic growth with due regard for the environment could enable new technologies to be developed which might contribute to growth. More research should be done on social indicators and in defining the economic magnitudes indicative of welfare. To facilitate decision-making, studies should be made at the macro-economic level to analyze such problems as possible clashes between environmental goals and various national economic goals. The general need for further research into the choice of instruments for pursuing optimum environmental policies is discussed. (See also W73-12675) (Weaver-Wisconsin)
W73-12676

ANTI-POLLUTION POLICY AND COST ALLOCATION: THE ISSUES IN PRACTICE,
Padua Univ. (Italy).
G. Muraro.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 41-57. 1 fig, 9 ref.

Descriptors: *Economic efficiency, *Pollution abatement, *Cost allocation, Compensation, Pollution taxes (Charges), Economic feasibility, Control, Unit costs, Costs, Air pollution, Water pollution, Sewage, Methodology.

Identifiers: *Pollution control, *Policies, Externalities, Pareto optimality, Charges, Italy, Indirect control.

Most of the economic literature concerned with pollution advocates taxation of the polluter as a means for establishing Pareto optimality. A general discussion is presented which is intended to provoke further consideration of the practical features of various pollution abatement problems and to analyze how they hamper the optimal solution. Representative cases illustrate these problems as found in situations of consumer-to-consumer and industry-to-consumer externalities. The question of interim policy, presently under study in Italy, is reviewed. The Italian program accepts the principle of government support for polluters as an interim policy. Although polluters will eventually be expected to meet standards or pay an optimal pollution tax, interim policy would provide incentives for the adoption of pollution control measures. (See also W73-12675) (Weaver-Wisconsin)
W73-12677

NOTES ON INFORMATION AND ADMINISTRATIVE COSTS IN THE THEORY OF EXTERNALITIES,
Queen Mary Coll., London (England). Dept. of Economics.
A. Coddington.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 59-65. 5 fig.

Descriptors: *Pollution abatement, *Administrative costs, Cost allocation, Cost-benefit theory, Standards, Economic feasibility.
Identifiers: *Externalities, Cost internalization, Allocative efficiency, Information costs, Pollution control.

Although the simple theory of externalities suggests that misallocation of resources due to divergent marginal private and social costs may be corrected to some degree by internalizing this difference, this theory fails to consider the social costs associated with internalization. Two categories of such costs are presented: the costs of acquiring the information necessary to determine the allocative optimum, and the costs of administering the system of cost allocation. Only when these costs are considered can one deal with the questions of whether allocative correction is economically feasible or whether the simple theory leads to an optimal correction allocation for which the marginal costs need to be considered. Instruments for cost internalization include (1) charges, seen either as a unit tax on externality or as administered pricing of environmental inputs, (2) compensation, and (3) direct controls. (See also W73-12675) (Weaver-Wisconsin)
W73-12678

ENVIRONMENTAL QUALITY INDICATORS AND SOCIAL INDICATORS,
Commissariat General au Plan, Paris (France).
B. Cazes.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 77-82. 2 tab.

Descriptors: *Pollution abatement, *Indicators, *Cost-benefit analysis, Social values, Decision making, Benefits.
Identifiers: *Pollution control, *Environmental quality indicators, *Social indicators.

General expectations of social indicators are interpreted as including expression of results rather than costs and of more definitive results than economic concepts such as the GNP. A general discussion of ideal social indicators is presented and a system in which a social indicator should be viewed is suggested. This system includes four elements: (1) indication of continuous change with respect to the initial situation, (2) measurement of values attributed to benefits arising from each situation, (3) indication of cost involved in bringing about alternative situations envisaged, and (4) measurement of the net benefit for each alternative situation considered. The advantages of the type of social indicator suggested are discussed. Environmental quality indicators fit into the analytical scheme given for social indicators, which means that in addition to collecting physical indicators, the profits and costs of alternative policies which would change the situation indicators to a greater or lesser extent must also be considered. (See also W73-12675) (Weaver-Wisconsin)
W73-12679

PETER BOHM.
Handelshogskolan i Stockholm (Sweden).

In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 83-91.

Descriptors: *Pollution abatement, *Estimating, *Measurement, Indicators, Cost-benefit analysis, Pricing, Decision making, Benefits, Welfare (Economics), Jurisdiction.
Identifiers: *Pollution control, Social indicators, 'Willingness-to-pay'.

Environmental deterioration has been overlooked in the past because the value of such deterioration is difficult to determine. Many alternative measures of these environmental effects might be constructed; however, it is argued that such indicators are not a prerequisite for meaningful environmental policy and that they may, in fact, be misleading for policy decisions. Instead, it is suggested that what is needed is (1) a large set of physical (non-aggregated) indicators keeping track of crucial parts of the environment and (2) a code to translate changes in such data into comprehensible consequences for human life and well-being. In addition, there must be a process by which the benefits of pollution control can be compared with the costs. It is suggested that an approach to estimating the 'willingness-to-pay' of those who would benefit from a positive change in environmental quality is theoretically less objectionable and potentially practicable than alternative approaches such as opinion polls. The experimental use of the 'willingness-to-pay' approach is advocated both at the local level and as a possible solution for some multi-jurisdictional pollution cases. (See also W73-12675) (Weaver-Wisconsin)
W73-12680

THE SET UP OF THE STATISTICAL SYSTEM WITHIN WHICH THE DETERIORATION OF THE HUMAN ENVIRONMENT WILL BE ESTIMATED,
Centraal Bureau voor de Statistiek, The Hague (Netherlands).
R. Hueting.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 93-101.

Descriptors: *Statistical methods, *Pollution abatement, *Market value, *Welfare (Economics), Measurement, Indicators, Cost analysis, Estimated costs, Estimated benefits.
Identifiers: *Pollution control, Collective goods, Netherlands.

The utility attributed to an 'environmental good' to be recovered through environmental pollution control and the cost of its achievement are found to be the prerequisite for striking a balance between the increasing consumption of industrial goods and the resultant diminishing supply of collective environmental goods, such as clean water, air, and space. The attempt of the Netherlands Central Bureau of Statistics to estimate this information is reviewed under three general headings: (1) goals of the investigation of the deterioration of the environment, (2) starting points of the investigation, and (3) methods of estimation. Under the first heading it was found that costs environmental control and change in the state and trend of the environment should be estimated. With these results economic growth of the past should be recalculated, and a well-rounded picture should be presented to policy makers. The investigation should begin first with an estimation of costs and second with an appraisal of the urgency of preferences for environmental control. Different methods of estimation are recommended for each environmental component (air, water, and soil) depending on techniques of environmental control employed in each case. (See also W73-12675) (Weaver-Wisconsin)
W73-12681

SOME LIMITATIONS OF BENEFIT-COST ANALYSIS IN RESPECT OF PROGRAMMES WITH ENVIRONMENTAL CONSEQUENCES,
London Univ., (England). Dept. of Economics.
A. Coddington, H. Opschoor, and D. Pearce.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 119-123. 1 fig.

Descriptors: *Pollution abatement, *Cost-benefit analysis, Decision making, Welfare (Economics), Input-output analysis.
Identifiers: *Pollution control, Revealed preferences, Externalities.

Benefit-cost analysis is an application of neo-classical welfare economics which allows social evaluations which are sensitive to individual preferences. However, the distinction between the welfare of and the preferences of an individual is introduced. This distinction must be noticed when revealed preferences are not based on an awareness of the results of choices and on the ability to link these states causally with consumption behavior or externalities which produce them. Although benefit-cost analysis should have a role in the formulation of environmental policy (1) the limited significance of the information it provides should be fully realized, and (2) it should be secondary to substantive investigation of environmental-economic interactions in physical terms. (See also W73-12675) (Weaver-Wisconsin)
W73-12682

OUTLINE OF A MACRO-ECONOMIC ANALYSIS OF ENVIRONMENTAL POLLUTION: A MULTI-SECTORAL APPROACH,
Oslo Univ. (Norway). Inst. of Economics.
Steinar O. Strom.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 125-141. 2 tab, 1 ppend.

Descriptors: *Input-output analysis, *Mathematical models, Pollution abatement, Pollution taxes (Charges), Projections, Long-term planning, Decision making.
Identifiers: Residuals, Macro-economic analysis, Norway, Materials balance.

A study carried out in cooperation with the Planning Division of the Norwegian Department of Finance is briefly described. The goal was an empirical analysis of environmental spillovers from economic activities found through long-run projection analyses based upon a macro-economic framework. The conceptual framework of the study views economis activities as affecting the natural environment through (1) occupation of space (2) extraction of raw materials, and (3) return of residuals. Residuals are not identical to pollutants because the natural environment is considered to have an assimilative capacity for residuals. The macro-economic empirical study follows from a dynamic, input-output model which

includes the generation of residuals. Data employed by the model were gathered using an extended rational accounting scheme, which is described. Generation of residuals is included in the model by giving goods and services positive values, and primary and secondary wastes negative values. The behavior of the model is studies as a function of the levels of charges levied on wastes. (See also W73-12675) (Weaver-Wisconsin)
W73-12683

EVALUATION OF THE ECONOMIC EFFECTS OF ANTI-POLLUTION PUBLIC POLICY,
M. Lo Cascio.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 143-179. 3 fig, 1 tab.

Descriptors: *Pollution abatement, *Mathematical models, *Economic impact, *Econometrics, Economic prediction, Institutional constraints, Evaluation, Legislation, Welfare (Economics), Resource allocation, Costs, Prices, Productivity.
Identifiers: *Pollution control, Italy, Macro-economic analysis.

A methodology is discussed for analysing the effect on the economic system of direct State-intervention to control the main forms of pollution. The methodology presented is aimed at an economic analysis which might provide a specific solution to the problem of compatiability between one or more explicit objects of the function of social welfare (for example, balanced distribution of incomes) and the implicit objective of its function (for instance, a certain philosophy on development). In order to accomplish this an econometric model is presented which provides a basis for studying the sequence of effects induced by anti-pollution measures. These include: (1) the direct effects on costs and prices, (2) the effects on the demand for equipment, and (3) the effects on the structure of final demand, on wages and on output levels. A solution is achieved through simultaneously assessing the direct and indirect effects of pollution on costs and prices in 54 economic sectors over the time period up to 1975. (See also W73-12675) (Weaver-Wisconsin)
W73-12684

ECONOMIC EFFECTS OF TECHNOLOGY CHANGES IN RELATION TO THE ENVIRONMENT,
Bari Univ. (Italy). Instituto di Merceologia.
G. Nebbia.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 181-197. 3 tab.

Descriptors: *Input-output analysis, *Pollution abatement, Economics, Welfare (Economics), Technology, Pollutants, Waste assimilative capacity, Wastes.
Identifiers: Residuals, Italy, Technological change, Macro-economic analysis.

One of the objectives of the environmental activity of the Organizations for Economic Co-operation and Development, is to analyze and evaluate the economic effects of environmental problems consisered as an integrated system related to economic and social development. Before such an approach can be made, biological and ecological statistics must be gathered; these should include quantities of resources entering into the production and consumption processes as well as the volume, chemical composition, and destination of related wastes. The specific nature and characteristics of these data are discussed. Given these statistics it is recommended that analysis form only a part of broader research directed towards the investigation of how technological change may optimize the production of commodities at a greater level of social and environmental welfare. Work being done towards this purpose at Bari University, Italy, is describes as the construction of circuits which trace the input and output flows of resources as well as the types of wastes associated with each output and the distribution of each of those wastes in the environment. (See also W73-12675) (Weaver-Wisconsin)
W73-12685

THE ROLE OF UNIFORM STANDARDS IN INTERNATIONAL ENVIRONMENTAL MANAGEMENT.
Maryland Univ., College Park. Coll. of Business and Public Administration.
J. H. Cumberland.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 239-253. 4 fig.

Descriptors: *Cost allocation, *Standards, *Pollution abatement, Management, Wastes, Pollutants, Industrial production, Welfare (Economics).
Identifiers: *International uniform standards, *Pollution control, Externalities, Pareto optimality.

The question of whether it is desirable to introduce a system of uniform international environmental standards is analyzed in the context of the differences in socio-economic structures, competitive strength, and natural resources between countries. It is argued that trade problems and purely economic criteria should not be allowed to obscure the need for compulsory standards when human health is threatened. Uniform standards are indispensable for ensuring biological safety and maintaining the quality of common property resources such as seas, lakes, rivers, and air. However, differences between countries are shown to make uniform standards ineffective with respect to cost allocation problems. Alternative economic measures, such as effluent charges and subsidies, would be superior to uniform product standards imposed upon heterogeneous economics. (See also W73-12675) (Weaver-Wisconsin)
W73-12686

EVALUATION OF ENVIRONMENTAL INTANGIBLES,
Department of Indian Affairs and Northern Development, Ottawa (Ontario). National and Historic Parks Branch.
N. H. Coober, and A. K. Biswas.
Genera Press, Bronxville, New York, 1973. 77 p. 14 fig, 320 ref.

Descriptors: *Intangible benefits, *Cost-benefit analysis, *Recreation, *Analytical techniques, Measurement, Aesthetics, Mathematical studies, Values, Evaluation.

Financial justification of environmental programs is vital to their implementation by either the private or public sectors. Such justification requires measuring intangible benefits and costs associated with various programs. Those techniques of measurement accepted in the past or currently proposed in the literature are synthesized, organized, and criticized. The report has three sections: (1) a historical and economic background of evaluation techniques and their relevance to benefit cost analysis, (2) a classification and discussion of techniques for economic evaluation of environmental intangibles and (3) a classification and critical review of non-monetary evaluation and comparison techniques. Two areas of methodology, each with opposing goals, may be distinguished. One seeks absolute values for intangibles; the other, relative values. Most authors reviewed agree on the need for a uniform approach allowing wider comparative evaluations. It is generally agreed that with minor modifications, methods suggested by Clawson (1959) are most expedient. The problem of inaccuracies in value estimates is thoroughly reviewed. (Weaver-Wisconsin)
W73-12688

PERUVIAN FISHERIES: CONSERVATION AND DEVELOPMENT.
California State Univ., Fresno.
B. B. Smetherman, and R. M. Smetherman.
Economic Development and Cultural Change, Vol 21, No 2, p 338-351, 1973. 2 tab, 46 ref.

Descriptors: *Conservation, *Commercial fishing, *Economic impact, Export, Economic efficiency. Marketing, Fish harvest, International waters, Regulation.
Identifiers: *Economic development, *Peru, *Fish meal, Anchovies, Development linkages, Nationalization, Guano.

Accelerated development of Peru's fishing industry has resulted from the growth in the production of fish meal from anchovies. The effects of this development on Peruvian politics and economics is reviewed. The economic history of Peru indicates its successive failures to channel primary resource booms into sustained economic growth. However, regulation of the anchovy resource has been attempted, and is becoming more effective. Regulation schemes have included encouragement of industrial self-restraint, imposition of closed seasons, and regulation of technology to control catch. In addition, Peru joined with other countries to organize and control the industry, and eventually nationalize fish meal marketing. The fishing industry's role in economic development is small as shown by the limited number of forward linkages that have accrued. However, the industry is very important for generating export income, and stimulating backward linkages and the consequential employment. The present government intends to expand the industry and use it as a base for sustained economic development. (Weaver-Wisconsin)
W73-12689

ECONOMICS IN SOIL AND WATER CONSERVATION,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 03F.
W73-12691

EXTINCTION OF A FISHERY BY COMMERCIAL EXPLOITATION: A NOTE,
London School of Economics and Political Science (England).
J. R. Gould.
Journal of Political Economy, Vol 80, No 5, p 1031-1038, 1972. 4 fig., 7 ref.

Descriptors: *Commercial fishing, *Economics, *Exploitation, Fish populations, Sustained yield, Yield equations, Mathematical models.
Identifiers: Extinction, Catch locus.

Inferences concerning the inability of the economic theory of commercial fishing to incorporate possible extinction of a fishery as drawn by Vernon Smith (1969) are reexamined. Traditional theory, as illustrated by analysis of the sustainable yield function of fishing effort, is shown to provide the basis for Smith's inference. A reformulation of this model provides a stronger analytical tool for the discussion of extinction. This reformulation introduces economic considerations via a catch locus and biological factors via a natural population increase curve. It is shown that commercial extinction of a fish population is conceivable despite the fact that fishing would become unprofitable long before the population of a given species was wiped out. This follows from the notion of minimum biologically viable population. (Weaver-Wisconsin)
W73-12692

WATER RESOURCE DECISON MAKING--HOW EFFECTIVE IS THE PUBLIC INPUT,
Oregon State Univ., Corvallis.

J. G. Monks.
In: 1973 Proceedings of the 19th Annual Meeting, 'Realism in Environmental Testing and Control,' April 2-5, 1973, Anaheim, California, p 345-350. 2 fig, 4 ref.

Descriptors: *Water resources development, *Decision making, *Social values, *Water Allocation (Policy), Social impact, Social aspects, Administration, Optimum development plans, Political aspects, Project planning, Benefits, Project post-evaluation, Standards, Social participation, *Oregon.
Identifiers: Case study, *Junction City (Ore.), Public preferences.

Natural resource management often necessitates that society collectively undertake development and control activities. However, in order that the governing system serve to achieve allocative efficiency as well as the results the public wants, resource management objectives must be clearly delineated, and progress monitored and carefully directed to insure that activities are carried out according to plan. The Junction City (Oregon) Water Control District was used as a case study of the current structure of water management to determine whether it satisfied these requirements. Beginning with its historical background, the effectiveness of the allocation process is questioned as to whether the objectives were defined in the terms of public interest and its developmental and control capabilities. It is concluded that standards for social or ecological outcomes were not precisely defined nor were outcomes a democratic representation of the project area population's preference. Legislation was used to benefit a few citizens at the expense of the many. In addition, the allocation structure did not effectively control adverse environmental effects which are of concern to the public. (Weaver-Wisconsin)
W73-12693

EXTERNALITIES, WELFARE, AND THE FEASIBILITY OF CORRECTIVE TAXES,
State Univ. of New York, Stony Brook.
R. Dusansky, and P. J. Kalman.
Journal of Political Economy, Vol 80, No 5, p 1045-1051, September/October 1972. 1 ref.

Descriptors: *Welfare (Economics), *Economic efficiency, *Mathematical models, *Optimization, Taxes.
Identifiers: *Corrective taxes, *Pigouvian tax policy, Profit maximization, Separable cost functions, Subsidies, Technological externalities, Cost functions.

Implementation of the Pigouvian tax policy for correcting technological externalities is dependent on the nature of cost functions faced by the relevant firms. The Pigouvian approach assumes separable cost functions where the marginal costs of the firm are dependent only on its own output. Given such cost functions the policy maker may impose corrective unit taxes (or subsidies) such that the actual outputs arrived at by individual profit maximization equal those deemed optimal as a result of social welfare maximization. In the case of non-separable cost functions, the marginal cost functions of the firms involved are interdependent. Because profit maximization decisions of individual firms are not independent of the output of other firms, selection of corrective taxes is severely complicated, if not made impossible. Given a partition of the assumed n-firm economy, the necessary and sufficient condition* for separability are solved for the class of cost functions consistent with feasible implementation of Pigouvian tax policy. Similarly, the feasible set of cost functions is derived given the assumption of multiproduct firms. Finally, these sets of feasible cost functions are shown to include a wider range than indicated by the Davis and Whinston results. (Weaver-Wisconsin)
W73-12694

ANTIPOLLUTION POLICIES, THEIR NATURE AND THEIR IMPACT ON CORPORATE PROFITS,
For primary bibliographic entry see Field 05G.
W73-12695

IDENTIFICATION AND ACHIEVEMENT OF ENVIRONMENTAL QUALITY LEVELS IN MANAGING THE USE OF NATURAL RESOURCES,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W73-12696

PUBLIC LAND USE POLICY: NEEDS, OBJECTIVES, AND GUIDELINES,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 04A.
W73-12697

COSTS AND PROFITABILITY IN THE COMMERCIAL FISHING INDUSTRY: THE INSURANCE DILEMMA,
Washington Univ., Seattle. Div. of Marine Resources.
M. L. Redfield.
Washington Sea Grant Publication WSG-MP 71-4, November 1971. 59 p 6 fig.

Descriptors: *Commercial fishing, *Insurance, *Cost-benefit analysis, Safety, Return (Monetary), Working conditions, Obsolescence, Costs, Profits, Trade associations, Compensation, Damages, Competition.
Identifiers: Foreign competition, Local competition, Policy formulation.

Insurance coverage constitutes a disproportionate share of the sharply increasing costs of operating a fishing vessel; this threatens the viability of the United States' fishing industry in the face of foreign competition. The current study found that high insurance costs reflected high vessel casuality rates caused by extreme competitive pressures and low profits. This condition follows from high labor costs, high costs of boats and equipment, which are required by law to be of United States manufacture (and consequently are more costly), the influence of price competition with imports and the system of free entry which reduces the catch of each participant. These high costs, combined with low profitability, result in deteriorating equipment and working conditions (smaller crews, longer hours, more intensive effort), an older labor force, and thus increased accidents. Alternatives for maximum reduction of insurance expenses include (1) schemes for continuing private insurance, (2) eliminating barriers against purchase and use of foreign equipment, (3) instituting limited entry to the industry, and (4) laissez-faire. Choice among alternatives must be based upon cost-benefit analysis. Limited comparison indicated that an optimal program will consist of safety regulation combined with alternatives (1) or (2). (Weaver-Wisconsin)
W73-12699

VALUATION OF TIMBER, FORAGE AND WATER FROM NATIONAL FOREST LANDS,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
P. F. O'Connell.
The Annals of Regional Science, Vol 6, No 2, p 1-14, 1972. 3 fig, 18 ref.

Descriptors: *National forests, *Lumbering, *Forage, *Value, Linear programming, Land management, Economic efficiency, Public lands, Recreation demand, Water demand, Profit, Market value, *Arizona.
Identifiers: *Salt-Verde Basin (Ariz.), Resource valuation, Multiple-use linear programming, Relative price trends.

A procedure for determining relative trade-off values for timber, forage and water resources is presented. Such a procedure is essential for resource management decisions concerning changes in water yields within a watershed. Data used are specific to the Salt-Verde Basin in central Arizona, but the methodology is applicable to any National Forest lands. Prices in the primary resource markets fail to reflect the full value of those resources to society because of market imperfections, administrative procedures, and various institutionalized constraints. Since each of the resources is an input for a product sold in markets characterized by competitive conditions, a range of resource values was derived from a simple valuation model based upon the price of secondary products such as lumber, livestock, and feed grains. Resource value was assumed to be within limits set by market prices paid and maximum prices manufacturers could pay. A multiple-use linear programming model is suggested to determine optimal land management programs given the needs of the public as projected from relative price trends of the secondary products studied. Future demand-supply conditions are expected to increase the value of timber output relative to the value of water and forage output. (Weaver-Wisconsin)
W73-12701

DETERMINATION OF PUBLIC ENVIRONMENTAL PREFERENCES IN WATER RESOURCES PLANNING AND DEVELOPMENT,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering; and Clemson Univ., S.C. Dept of Economics.
Benjamin C. Dysart, III, and Andy H. Barnett.
In: American Society of Civil Engineers Annual and National Environmental Engineering meeting, October 18-22, 1971, St. Louis, Missouri. 28 p. 2 fig., 7 tab. OWRR B-017-SC (6).

Descriptors: *Surveys, *Social values, *Planning, *Water quality, Social participation, Water pollution control, Industrial wastes, Correlation analysis, Water resources development, Decision making, *South Carolina.
Identifiers: *Public preferences, *Greenville County (S.C.), Reedy River (S.C), Willingness-to-pay, Mail questionnaire.

A crucial element of the water resources planning process is the evaluation of public environmental preferences early in the plan's formulation. The mail questionnaire technique was employed to provide reliable information and minimize the time, difficulty and expense. Although public referenda authorize specific development plans, the reported technique approximates acceptable expenditure levels and indicates which sectors of the populace might respond to additional educational efforts concerning the desirability of the project. The feasibility of implementation of water quality improvement plans for Greenville County, South Carolina, was used as a case for study. Response to the mail questionnaire established an ordinal preference ranking of potential uses of the Reedy River with scenic appeal ranking first. Correlation analysis of public ranking of critical problems indicated that water pollution was third to crime and education. Preference analysis indicated that the public supported increased expenditure for water pollution control and that residents were willing to bear what they considered to be a reesonable cost of a significant level of improvement in environmental quality. (Weaver-Wisconsin)
W73-12706

ELEMENTS OF THE WATER RESOURCES SITUATION IN ALABAMA,
Geological Survey, University, Ala.
D. B. Knowles, and H. C. Barksdale.
Available from NTIS, Springfield, Va 22151 as PB-214 181. Price $3.75 printed copy; $1.45 cents

microfiche. December 1969 (revised August 1970). 28 p.

Descriptors: *Water resources development, *Administration, *Alabama, Project planning, Water utilization, Hydrology, Flood plains, Streamflow, Low flow, Waste disposal, Water pollution control, Gaging stations, Observation wells, Water quality, Estuaries, Reviews.

The water-resources situation in Alabama has many facets ranging from water supply to waste disposal, from floods to droughts, and from navigation to recreation. Within this wide range of topics two common elements have been selected for consideration-- factors intimately related to the hydrologic cycle, and significant areas wherein the knowledge and data are inadequate. A discussion of the hydrologic cycle provides a background of understanding. This is followed by a discussion of the types of data and studies that are required for a better understanding of water related problems with recommendations for needed supplemental or additional studies. Most water-resources problems relate in one way or another to the availability of water. Problems of water supply cover much of the water-resources field and are not restricted to the availability of water for domestic, industrial, or agricultural purposes. Under this concept, water for operation of navigational locks, dilution of wastes, launching of a boat or for support of fisheries all become water-supply problems. It is in this broader sense that water-supply problems and the knowledge and data needed for their solution are discussed. (See also W73-12315) (Woodard-USGS)
W73-12749

MULTIPLE-USE PROBLEMS IN THE GREAT LAKES.
Available from NTIS, Springfield, Va. 22151 as COM-73-10249 - Price $3.00 printed copy; $1.45 microfiche. Wisconsin University Sea Grant Program Report, Wis-SG-72-107 (Public Information Report No 7) 1972. 50 p.

Descriptors: *Regional development, *Great Lakes, *Water resources development, *Water policy, *Environmental control, Water pollution control, International waters, Economic aspects, Social aspects, Legal aspects, Water demand, Water supply, Water quality, Ecology, Water utilization, Multiple-purpose projects, Management, Conferences, Reviews, Evaluation.
Identifiers: Symposium.

This is the last in a three-part series of public information reports based on an October 1970 University of Wisconsin Sea Grant Conference, 'The Great Lakes-Sink or Swim.' One of the issues that frequently is identified in Great Lakes research is the problem of multiple use and the attendant conflicts that the users may face. In the past these conflicts seemed inevitable but not catastrophic. Population and use rate, however, is increasing, and the interference from one user to the next is demanding more attention to resource management practices. The University of Wisconsin Sea Grant program has attempted to look at the use pattern as a starting point for problem identification. This part contains the following papers: Our Environmental Equilibrium in Nature, by D. V. Anderson; A Symposium on the Preservation and Multiple-Use Problems in the Great Lakes, by P. M. Higgins; Toward a Regional Policy for the Great Lakes, by J. L. Hazard; the Planning Viewpoint, by D. C. N. Robb; and An Industrial Point of View 1970, by S. Burnstein. (See W73-12961 thru W73-12965) (Woodard-USGS)
W73-12960

OUR ENVIRONMENTAL EQUILIBRIUM IN NATURE,
Toronto Univ. (Ontario).
D. V. Anderson.
In: Multiple-Use Problems in the Great Lakes; Wisconsin University Sea Grant Report WIS-SG-72-107 (Public Information Report No 7), p 7-13, 1972.

Descriptors: *Regional development, *Great Lakes, *Water resources development, *Water policy, Environmental effects, Environmental control, Water pollution control, International waters, Economic aspects, Social aspects, Legal aspects, Water demand, Water supply, Water quality, Ecology, Water utilization, Management, Multiple-purpose projects, Reviews.
Identifiers: Symposium.

The public must decide how active the control of the development of the shores of the Great Lakes should be before the water managers can begin to act. Several areas of decision are: whether the cities should be allowed to make use of lake bottoms for extending valuable lakeside real estate; whether to protect the north shore of Lake Erie from erosion, the major source of pollution in the lake, by constructing polders; whether to place the dykes a mile offshore to claim 100 sq mi land, rather than to maintain the status quo; whether to attempt to sustain aquatic life; whether to site powerplants for warming harbor waters and canals, or for power needs only; and finally, whether to stop discharging sewage into the lakes and what treatment to use. (See also W73-12960) (Woodard-USGS)
W73-12961

A SYMPOSIUM ON THE PRESERVATION AND MULTIPLE-USE PROBLEMS IN THE GREAT LAKES,
Department of Fisheries and Forestry, Ottawa (Ontario).
For primary bibliographic entry see Field 05C.
W73-12962

TOWARD A REGIONAL POLICY FOR THE GREAT LAKES,
Michigan State Univ., East Lansing.
J. L. Hazard.
In: Multiple-Use Problems in the Great Lakes; Wisconsin University Sea Grant Report WIS-SG-72-107 (Public Information Report No 7), p 23-34, 1972. 15 ref.

Descriptors: *Regional development, *Great Lakes, *St. Lawrence Seaway, *Water policy, *Environmental control, Planning, Water resources development, International waters, Federal Government, State governments, Economic aspects, Social aspects, Water demand, Water supply, Water utilization, Multiple-purpose projects, Management.

An overview of the Great Lakes-St. Lawrence system is presented to inform the general public as well as industrial and political decision makers. The movement toward a regional policy might take on more coherence as it matures by increasing efforts toward: achieving cohesive regional units around the lakes; identifying changing regional needs and goals; gaining a systematic knowledge of the lakes, their behavior and condition; developing programs that satisfy the needs of the present and future generations; and implementing those programs through appropriate channels--regional, federal, dominion--and now, responsive modes of organization. These steps would provide flexible policies for the lakes. And if successful in this major endeavor, it will be possible to move toward the following objectives over the long run: to preserve and improve the lakes; to expand the mid-continent economy; to enhance the region's contribution to the external world; and to harmonize working relations with the provinces and Canada. (See also W73-12960) (Woodard-USGS)
W73-12963

THE PLANNING VIEWPOINT,
Great Lakes Basin Commission, Ann Arbor, Mich.
D. C. N. Robb.
In: Multiple-Use Problems in the Great Lakes; Wisconsin University Sea Grant Report WIS-SG-72-107 (Public Information Report No 7), p 35-45, 1972.

Descriptors: *Regional development, *Great Lakes, *Water policy, *Environmental control, Planning, Water resources development, International waters, Legal aspects, Economic aspects, Social aspects, Water demand, Water supply, Water utilization, Multiple-purpose projects, Management.

The Great Lakes are used for water supply, transportation, recreation, power, fish, and as dumps for solid and liquid waste disposal. The lakes have a very large, but still limited, capacity to support any one of the above uses. In addition, as individual uses increase, they begin to conflict with each other. Transportation, with its demand for high lake levels, encourages conditions which result in shore erosion with negative effects on water supply, recreation and fish. Increasing use of the lakes for waste disposal creates problems for fish, recreation, water supply and, to a limited extent, for power. The demands on the lakes from all of the above uses are dependent to a large extent on both population and per capita demand, both of which continue to increase. Serious attention is just beginning to be paid to the possibilities of managing population and per capita demand toward partial solution of present environmental problems. Effective resource management requires: clearly defined goals and objectives; adequate data on present conditions; adequate procedures to predict consequences on the resources of alternative future actions; clear definition of responsibility and authority; and adequate funding. (See also W73-12960) (Woodard-USGS)
W73-12964

AN INDUSTRIAL POINT OF VIEW-1970,
Wisconsin Electric Power Co., Milwaukee.
S. Burnstein.
In: Multiple-Use Problems in the Great Lakes; Wisconsin University Sea Grant Report WIS-SG-72-107 (Public Information Report No 7), p 47-51, 1972.

Descriptors: *Regional development, *Great Lakes, *Water resources development, *Water policy, *Environmental control, Industry, Electric power industry, International waters, Economic aspects, Social aspects, Legal aspects, Water demand, Water supply, Water utilization, Multiple-purpose projects, Management.

The Great Lakes present a unique natural resource whose utilization has sponsored the basic activities of over 60 million people who live around its shores. Continued use of this resource is unavoidably tied to the welfare of these millions. Preservation of the quality of this resource is essential to its continued use. The multiple uses of the Great Lakes, with minor omissions, are discussed in five basic categories: drinking water and sanitation; transportation; industrial processes; food supply; and recreation. Industry is a summation of all the other uses. It is impossible for drinking water and sanitation to serve the vast population of the region without piping and power and the waterworks and the public works that industry provides. A transportation industry on the lakes, commercial fishing industries, and even a recreational industry, are all typical of those devices which in their specialized areas create or enhance the value of things. The electric power industry, which is perhaps the key to all other industrial and economic development, is the largest nonconsumptive water user on the Great Lakes. (See also W73-12960) (Woodard-USGS)
W73-12965

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

REGIONAL SEWER SYSTEM, PLANNING AND COST ESTIMATION MODEL,
Regional Planning Council, Baltimore, Md.
For primary bibliographic entry see Field 05G.
W73-12357

THE EFFECT OF PRICE AND OTHER SELECTED VARIABLES ON WATER CONSUMPTION,
Mississippi Univ., University. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 06B.
W73-12495

ENVIRONMENTAL COST OF MINING,
Bureau of Mines, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-12687

EXTERNALITIES, WELFARE, AND THE FEASIBILITY OF CORRECTIVE TAXES,
State Univ. of New York, Stony Brook.
For primary bibliographic entry see Field 06B.
W73-12694

ANTIPOLLUTION POLICIES, THEIR NATURE AND THEIR IMPACT ON CORPORATE PROFITS,
For primary bibliographic entry see Field 05G.
W73-12695

IDENTIFICATION AND ACHIEVEMENT OF ENVIRONMENTAL QUALITY LEVELS IN MANAGING THE USE OF NATURAL RESOURCES,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W73-12696

PUBLIC SUPPORT OF PRIVATE WATER RESOURCE DEVELOPMENT IN AGRICULTURE--WITH IMPLICATIONS FOR FIRM GROWTH,
Wyoming Agricultural Experiment Station, Laramie.
For primary bibliographic entry see Field 04B.
W73-12698

COSTS AND PROFITABILITY IN THE COMMERCIAL FISHING INDUSTRY: THE INSURANCE DILEMMA,
Washington Univ., Seattle. Div. of Marine Resources.
For primary bibliographic entry see Field 06B.
W73-12699

NOTE ON CHARGES AND BRIBES IN THE LONG RUN WITHIN WATERSHEDS,
Wyoming Univ., Laramie. Coll. of Commerce and Industry.
For primary bibliographic entry see Field 05G.
W73-12702

CONSTRUCTION COSTS OF WATER SUPPLY AND SEWAGE NETWORKS IN POLAND--19-61-1970,
Institute of Public Utility Services, Warsaw (Poland).
M. Gorczyca.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA6, p 9458-1003, 1972. 3 fig, 8 tab.

Descriptors: *Construction costs, *Water supply, *Sewage, *Cost analysis, Estimated costs, Direct costs, Unit costs, Return (Monetary).
Identifiers: *Warsaw (Poland), *Lodz (Poland), Profitability, Cost, *Poland.

The Institute of Public Utility Services at Warsaw, Poland, has studied the building costs of water supply and sewage networks in order that any cost fluctuations may be continuously supervised, compared with building estimates, and profitability assessed. The factors isolated as primary determinants of these costs included the following site features: (1) hydrogeological conditions, (2) costs of removal of previous installations, (3) technical, economic and organizational solutions used by contractors, (4) unusual construction conditions, and (5) the level of estimated prices for construction assembly work and production factors. A classification and calculation scheme is presented for the analysis of building costs. Direct costs are those associated with a specific site while general costs are site-unrelated. Unit costs of building data indicated considerable variation in costs between various pipe cross sections and materials. Analysis of these costs for the period 1961-1970 with a combined index indicated a strong price preference for asbestos-cement pipes. Despite price increases during the same period, a steady trend of profits had prevailed. (Weaver-Wisconsin)
W73-12703

COST CURVES FOR CROSS-DRAINAGE WORKS,
Government Coll. of Engineering, Aurangabad (India).
For primary bibliographic entry see Field 04A.
W73-12704

A STUDY OF THE ECONOMIC IMPACT ON THE STEEL INDUSTRY OF THE COSTS OF MEETING FEDERAL AIR AND WATER POLLUTION ABATEMENT REQUIREMENTS. PART I - EXECUTIVE SUMMARY.
For primary bibliographic entry see Field 05G.
W73-12707

IMPACT OF COSTS ASSOCIATED WITH NEW ENVIRONMENTAL STANDARDS UPON THE PETROLEUM REFINING INDUSTRY. PART I. THE IMPACT OF ENVIRONMENTAL CONTROL COSTS.
Sobotka (Stephen) and Co., New York.
For primary bibliographic entry see Field 05G.
W73-12708

A DESCRIPTIVE ANALYSIS OF THE BAKERY PRODUCTS INDUSTRY DETAILING INDUSTRY TRENDS AND CHARACTERISTICS RELEVANT TO ECONOMIC IMPACT ANALYSIS OF ENVIRONMENTAL STANDARDS. PART II.
Ernst and Ernst, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-12709

A STUDY OF THE IMPACT OF POLLUTION STANDARDS AND CHARGES ON THE BAKERY INDUSTRY. PART III.
Ernst and Ernst, Washington D.C.
For primary bibliographic entry see Field 05G.
W73-12710

6D. Water Demand

COMPREHENSIVE PUBLIC WATER SUPPLY STUDY FOR SCHENECTADY COUNTY, NEW YORK.
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
For primary bibliographic entry see Field 03D.
W73-12358

OUTDOOR RECREATION IN THE BALTIMORE AREA.
Regional Planning Council, Baltimore, Md.

July 1967. 156 p, 23 fig, 21 tab, 56 ref, 1 append.

Descriptors: *Recreation, *Recreation demand, *Watersheds, Planning, Models, Projections, Standards, *Maryland, Regional analysis, Regional development.
Identifiers: Open space, Regional Planning Council, *Baltimore region, Water-based recreation.

Study focuses on specific needs and preferences of people in the five-county Baltimore region and looks at recreation and open space in terms of several types of activities. A key element in this analytical approach is the recreation trip distribution model which projects the number and location of trips for various recreation purposes. The recreation plan is based on a system of open space corridors proposed in the Council's Suggested General Development Plan and includes numerous park areas and activities to be incorporated within this framework. These activities include swimming, picnicking, fishing, bicycling, boating, camping, hiking, and driving for pleasure. Special attention is placed on use of individual watersheds in the region and the demand-supply relationships for each watershed. (Elfers - North Carolina)
W73-12360

6E. Water Law and Institutions

ANNUAL REPORT OF THE NEW YORK STATE URBAN DEVELOPMENT CORPORATION, 1972.
New York State Urban Development Corp., New York.
For primary bibliographic entry see Field 03D.
W73-12356

INTERIM AREAWIDE WATER AND SEWER PLAN: BEL-O-MAR AREA.
Candeub, Fleissig and Associates, Newark, N.J.
For primary bibliographic entry see Field 05G.
W73-12362

MEASURING AND DEVELOPING METHODS OF ATTITUDE AND MOTIVATIONAL CHANGE IN IMPLEMENTING THE BIG BLUE RIVER BASIN WATER PLAN,
Doane Coll., Crete, Nebr.
For primary bibliographic entry see Field 06B.
W73-12491

EVALUATION OF URBAN WATER MANAGEMENT POLICIES IN THE DENVER METROPOLITAN AREA,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 05G.
W73-12510

ONTARIO UNHAPPY WITH EFFORTS OF INDUSTRY TO HALT POLLUTION,
For primary bibliographic entry see Field 05G.
W73-12538

REPORT ON ARKANSAS VALLEY CONDUIT FOR SOUTHEASTERN COLORADO WATER CONSERVANCY DISTRICT, FOUR CORNERS REGIONAL COMMISSION AND U.S. BUREAU OF RECLAMATION.
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 04A.
W73-12577

THE ROLE OF UNIFORM STANDARDS IN INTERNATIONAL ENVIRONMENTAL MANAGEMENT.
Maryland Univ., College Park. Coll. of Business and Public Administration.
For primary bibliographic entry see Field 06B.
W73-12686

FLOOD INSURANCE FOR VIRGINIA.
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 06F.
W73-12690

WATER RESOURCE DECISON MAKING--HOW EFFECTIVE IS THE PUBLIC INPUT,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 06B.
W73-12693

PUBLIC LAND USE POLICY: NEEDS, OBJECTIVES, AND GUIDELINES,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 04A.
W73-12697

PUBLIC SUPPORT OF PRIVATE WATER RESOURCE DEVELOPMENT IN AGRICULTURE--WITH IMPLICATIONS FOR FIRM GROWTH,
Wyoming Agricultural Experiment Station, Laramie.
For primary bibliographic entry see Field 04B.
W73-12698

EFFECTS OF PESTICIDES IN WATER--A REPORT TO THE STATES.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-12752

6F. Nonstructural Alternatives

NEW TECHNIQUES FOR PARTICIPATIVE PLANNING IN WATER RESOURCES,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 06B.
W73-12472

FLOOD INSURANCE FOR VIRGINIA.
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.

(1972)

Descriptors: *Insurance, *Flood damage, *Flood protection, *Virginia, Land use.
Identifiers: National Insurance Program, Insurance coverage.

Basic public information is presented to Virginia residents of flood-prone communities of the danger of floods, their potential damage, or control, and opportunities for flood insurance through the National Flood Insurance Program. This low cost insurance program requires that governmental bodies of insured communities plan and adopt land-use and Land management measures that will reduce flood loss. Protection from economic loss is provided while at the same time potential losses are reduced. Coverage includes most structures and their contents up to specified limits. An Emergency Program allows for coverage during the interim period in which land use plans are being formulated and implemented. Public support is encouraged and recommendations are made for specific community actions to obtain this insurance. (Weaver-Wisconsin)
W73-12690

6G. Ecologic Impact of Water Development

CALIFORNIA POWER PLANT SITING STUDY: VOLUMES, I, II, AND III.
Holmes and Narver, Inc., Anaheim, Calif.
For primary bibliographic entry see Field 05G.
W73-12574

ENVIRONMENTAL IMPACT STUDY.
Ocean and Atmospheric Science, Inc., Dobbs Ferry, N.Y.
For primary bibliographic entry see Field 05G.
W73-12580

MAINTENANCE OF THE HUDSON RIVER CHANNEL, NEW YORK, NAVIGATION PROJECT, (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 08B.
W73-12588

MATHEMATICAL MODELS IN ECOLOGY, PROCEEDINGS OF THE 12TH SYMPOSIUM.
For primary bibliographic entry see Field 06A.
W73-12653

PROBLEMS OF ENVIRONMENTAL ECONOMICS.
For primary bibliographic entry see Field 06B.
W73-12675

ENVIRONMENTAL QUALITY INDICATORS AND SOCIAL INDICATORS,
Commissariat General au Plan, Paris (France).
For primary bibliographic entry see Field 06B.
W73-12679

THE SET UP OF THE STATISTICAL SYSTEM WITHIN WHICH THE DETERIORATION OF THE HUMAN ENVIRONMENT WILL BE ESTIMATED,
Centraal Bureau voor de Statistiek, The Hague (Netherlands).
For primary bibliographic entry see Field 06B.
W73-12681

ECONOMIC EFFECTS OF TECHNOLOGY CHANGES IN RELATION TO THE ENVIRONMENT,
Bari Univ. (Italy). Instituto di Merceologia.
For primary bibliographic entry see Field 06B.
W73-12685

EVALUATION OF ENVIRONMENTAL INTANGIBLES,
Department of Indian Affairs and Northern Development, Ottawa (Ontario). National and Historic Parks Branch.
For primary bibliographic entry see Field 06B.
W73-12688

PROPOSED OIL POLLUTION REGULATIONS, (FINAL ENVIRONMENTAL STATEMENT).
Coast Guard, Washington, D.C. Marine Environmental Protection Div.
For primary bibliographic entry see Field 05G.
W73-12955

OUR ENVIRONMENTAL EQUILIBRIUM IN NATURE,
Toronto Univ. (Ontario).
For primary bibliographic entry see Field 06B.
W73-12961

07. RESOURCES DATA

7A. Network Design

A PROPOSED STREAMFLOW DATA PROGRAM FOR CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 04A.
W73-12748

ELEMENTS OF THE WATER RESOURCES SITUATION IN ALABAMA,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 06B.
W73-12749

REAL-TIME INTERACTIVE INSTRUMENTATION,
Purdue Univ., Lafayette, Ind.
D. O. Jones.
Available from Univ. Microfilms, Inc., Ann Arbor, Mich. 48106. Order No 73-6142. PhD Dissertation, 1970. 167 p.

Descriptors: *Instrumentation, *Digital computers, *Data processing, *Optimization, Automatic control, Laboratory tests, Testing procedures, Laboratory equipment.
Identifiers: *Real-time computers, *Interactive computer systems, Stationary electrode polarography, Data interpretation, On-line computers.

The critical experimental design parameters elucidated by a software-oriented study were considered and the translation to hardware-oriented instrumentation is described. The hardware device was evaluated experimentally in the laboratory and the capabilities compared to the software-generated experimentation. Results indicate the essentially identical analytical performance is achieved at greatly reduced complexity of operation and expense. In addition, the hardware-oriented instrumentation provides the capability for greater measurement rates. (Holoman-Battelle)
W73-12850

7B. Data Acquisition

OBSERVATIONS OF INTERMEDIATE AND SMALL SCALE TURBULENT WATER MOTION IN A STRATIFIED ESTUARY (PARTS I AND II),
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 02L.
W73-12424

THE EVALUATION OF EXISTING FIELD TEST KITS FOR DETERMINING FREE CHLORINE RESIDUALS IN AQUEOUS SOLUTIONS,
Army Medical Environmental Engineering Research Unit, Edgewood Arsenal, Md.
For primary bibliographic entry see Field 05A.
W73-12426

EVALUATION OF ERTS DATA FOR CERTAIN OCEANOGRAPHIC USES,
National Environmental Satellite Service, Washington, D.C.
A. E. Strong.
Available from NTIS, Springfield, Va. 22151 as E73-10017 - Price $3.00 printed copy; $1.45 microfiche. NASA Contract Report CR-129943 (Environmental Research Technology Satellite Proposal No 106), 1973.

Descriptors: *Water pollution sources, *Lake Erie, *Lake Ontario, *Remote sensing, *Aerial photography, Thermal pollution, Sediment transport, Algae, Industrial wastes, Effluents, Path of pollutants, Satellites (Artificial), Instrumentation.
Identifiers: *ERTS.

An evaluation of ERTS projects is presented for the fourth bimonthly reporting period, October to December 1972. A NOAA Buffalo Dehavaland Aircraft was instrumented with a multispectral camera and dual-channel IR scanner for environmental studies of Lake Erie and Lake Ontario. The Buffalo aircraft flew most of the Lake Erie shoreline west of Long Point, Ontario, and Ashtabula, Ohio. ERTS-1 crossed Lake Erie while the Buffalo was imaging the Canadian shoreline. Major features observed were: thermal and sediment features off Pointe aux Pins and Pointe Pelee; a thick algal mat in the Bass Islands area several hundred feet wide and 10-15 miles long; a portion of the Cuyahoga River plume at Cleveland; powerplant effluent near Monroe, Michigan; and Detroit River and Lake St. Clair. The western side of Lake St. Clair was black. Expected accomplishments for the next reporting period are outlined. (Woodard-USGS)
W73-12429

VARIABLE SAMPLING FREQUENCY - A NEW ADAPTIVE TECHNIQUE,
A. A. Sutherland, Jr.
Control Engineering, Vol 20, No 4, p 33-35, April 1973. 3 fig, 1 ref.

Descriptors: *Sampling, *Antomatic control, Control systems, Monitoring, Algorithms.
Identifiers: *Adaptive control.

An adaptive technique has been developed for sampling for control of plant processes which vary randomly with time. A simple digital algorithm samples plant status according to the frequency of variation--less frequent sampling with slow variations and more frequent sampling with increased variations. The method purportedly provides control action economy and good predictability of plant behavior. (Little-Battelle)
W73-12616

GRAPHIC DISPLAYS FOR PROCESS INSIGHT,
R. Toensing.
Control Engineering, Vol 20, No 4, p 47-49, April 1973.

Descriptors: *Design criteria.
Identifiers: *Display systems, Data displays.

General guidelines are given for designing process displays which minimize problems of the man-machine interface. (Little-Battelle)
W73-12617

HEATED SENSORS FOR FLOW MEASUREMENTS,
R. Wasserman, and H. Grant.
Instruments and Control Systems, Vol 46, No 5, p 59-61, May 1973. 4 fig, 4 tab.

Descriptors: *Water temperature, *Flow rates, *Viscosity, *Reynolds number, *Thermal conductivity, Temperature, Electrical equipment.
Identifiers: *Hot wire sensors, *Hot film sensors, Sensors.

Heated sensors consist of electrical probes connected to a bridge circuit which provides a current flow to maintain the temperature of the probe above ambient. By knowing characteristics of the fluid to be measured and the probe, it is possible to measure temperature, viscosity, Reynolds number, thermal conductivity, and mass flow. Where fluid temperature fluctuates, errors in mass flow measurements can be compensated for by computation or by using an additional unheated sensor. Measurement circuits may employ either constant temperature or constant bridges depending on the requirements of the system. Probes are constructed of platinum, tungsten, or platinum-iridium wire of 0.00008 to 0.001 inch diameter or of films of resistance material plated on ceramic or quartz substrates. A comparison of the performance characteristics of wire and film probes in various fluids is given. (Little-Battelle)
W73-12618

AN INTERDISCIPLINARY STUDY OF THE ESTUARINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS,
Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
For primary bibliographic entry see Field 05A.
W73-12629

WATER QUALITY DETERMINATIONS IN THE VIRGIN ISLANDS FROM ERTS-A DATA,
Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
For primary bibliographic entry see Field 05A.
W73-12630

SELECTIVITY OF TOWED-NET SAMPLERS,
National Marine Fisheries Service, Honolulu, Hawaii. Southwest Fisheries Center.
R. A. Barkley.
U S Natl Mar Fish Serv Fish Bull. Vol 70, No 3, p 799-820. 1972. Illus.
Identifiers: Animals, *Nekton, Nets, *Plankton, *Samplers, Selectivity, Towed nets.

The ideal sampler for plankton and nekton is one whose selective characteristics are known to be appropriate to any given problem, so that it catches the right organisms, and rejects others, with known efficiency. A quantitative theoretical analysis of 1 aspect of selectivity, avoidance of towed-net samplers is presented. The theory is evaluated against 3 sets of paired samples obtained by different nets at different speeds to provide absolute and relative tests of its validity. A single sample obtained by 1 net towed at 1 speed is then analyzed to illustrate the procedure. Final evaluation of the theory awaits studies of animal behavior when confronted by a sampler, but the theory provides informative and reasonable interpretations of plankton and nekton catch data, particularly estimates of population abundance and mesh losses, even when behavior of the animals is not known.--Copyright 1973, Biological Abstracts, Inc.
W73-12669

CONVECTIVE GROUND WATER FLOW,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 02F.
W73-12722

MEASUREMENT OF CURRENTS IN THE GREAT LAKES,
Ministry of the Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 02H.
W73-12741

NEW APPLICATIONS OF GEOPHYSICAL METHODS TO GROUND-WATER PROBLEMS IN PENNSYLVANIA,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 02F.
W73-12783

AUGER SOIL SAMPLER FOR HERBICIDE RESIDUES,
Agricultural Research Service, College Station, Tex. Plant Science Research Div.
For primary bibliographic entry see Field 02G.
W73-12794

NOMOGRAPH FOR THE SATURATION PERCENTAGE OF SOIL,
For primary bibliographic entry see Field 02G.
W73-12807

LASER INDUCED FLUORESCENCE IN ALGAE: A NEW TECHNIQUE FOR REMOTE DETECTION,
Sparcom, Inc., Alexandria, Va.
For primary bibliographic entry see Field 05A.
W73-12841

A SIMPLE METHOD FOR RECORDING FISH HEART AND OPERCULUM BEATS WITHOUT THE USE OF IMPLANTED ELECTRODES,
Maine Univ., Orono. Dept. of Zoology.
S. A. Rommel, Jr.
Journal of the Fisheries Research Board of Canada, Vol 30, No 5, p 693-694, May 1973. 1 fig, 4 ref.

Descriptors: *Electrodes, *Fish physiology, *Methodology, Fish, Atlantic salmon.
Identifiers: *Heart rate, *Opercular beats, Electrocardiograms, Anguilla rostrata, American eel, Salmo salar.

A method is described by which heart and opercular beats can be recorded from gently restrained, freely-swimming fish without implanting electrodes. The fish were restrained in soft plastic mesh cages so that the long axis of the body was usually aligned in one direction. Electrodes, consisting of carbon rods with leads to a polygraph, were fastened to either end of the cage. Electronic filtering was used to eliminate low frequency swimming movements and high frequency electrical noises. Atlantic salmon and American eel were used in the tests. The method was usable in waters with resistivities between 4000 ohm-cm and 400 ohm-cm. Best results were obtained in water of about 1000 ohm-cm. Excellent agreement was obtained between the water electrode recording and implanted electrode recordings. The method can minimize fish handling in some physiological experiments. (Mortland-Battelle)
W73-12858

LITHIUM SILICATE SEDIMENTATION TRACER FOR SHOAL DEPOSIT STUDIES,
IIT Research Inst., Chicago, Ill.
For primary bibliographic entry see Field 05B.
W73-12862

AN IMPROVED AA MICROSAMPLING SYSTEM,
Perkin-Elmer Corp., Norwalk, Conn.
For primary bibliographic entry see Field 05A.
W73-12865

SPECTROPHOTOMETRIC DETERMINATION OF AMMONIA,
Cham/Hill, Corvallis, Oreg.
For primary bibliographic entry see Field 05A.
W73-12886

7C. Evaluation, Processing and Publication

CRITICAL REVIEW OF CURRENTLY AVAILABLE WATER QUALITY MODELS,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 06A.
W73-12352

IDENTIFICATION OF WATER RESOURCES PLANNING PROBLEMS IN THE METROPOLITAN AREA OF GREATER SAN ANTONIO AND ITS ASSOCIATED COUNTIES,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 06B.
W73-12354

GEOHYDROLOGY OF THE DOVER AREA, DELAWARE,
Delaware Geological Survey, Newark.
K. D. Woodruff.
Hydrologic Map Series, No 1, 1972. 1 sheet, 1 map, 7 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Water quality, *Delaware, *Maps, Hydrographs, Water wells, Pumping, Drawdown, Groundwater recharge, Rainfall, Aquifers, Chemical analysis.
Identifiers: *Dover (Del).

Total groundwater use in the Dover, Del., area, principally by the city of Dover and the Dover Air Force Base to the southeast, is around 6 to 8 mgd. About 6 to 7 mgd is pumped from the Cheswold aquifer while the remainder comes from the Piney Point Formation. Outside the areas served by public wells, most domestic water comes from the Columbia Formation or the Frederica and Cheswold aquifers. Several large irrigation wells are located where either the Frederica or Cheswold aquifers subcrop directly beneath sands of the Columbia Formation. The Cheswold aquifer is presently being consistently overpumped by about 1-2 mgd and records also indicate that levels in the Piney Point Formation are dropping, particularly during the summer months. Transmissibilities for the Cheswold aquifer range from about 11,000 gpd/ft to the south of Dover to about 33,000 gpd/ft near the middle of Dover. Coefficients of storage range from 0.0003 to 0.006. Transmissibilities in the Piney Point Formation vary from 6,000 gpd/ft north of Dover to 36,000 gpd/ft southeast of Dover. Except in the extreme northern part of the area aquifers beneath the Piney Point contain water having chloride concentrations greater than 250 mg/l. Maps and illustrations describe the hydrogeology and water quality. (Woodard-USGS)
W73-12425

THE COMPUTATION OF TIDES AND CURRENTS IN ESTUARIES AND CANALS,
Massachusetts Inst. of Tech., Cambridge. Hydrodynamics Lab.
For primary bibliographic entry see Field 02L.
W73-12428

HYDROLOGICAL YEAR-BOOK OF ISRAEL, 1970/71.
Ministry of Agriculture, Jerusalem (Israel). Water Commission.
For primary bibliographic entry see Field 02A.
W73-12432

RESERVOIR-YIELD ESTIMATION PROCEDURES,
British Columbia Univ., Vancouver.
For primary bibliographic entry see Field 04A.
W73-12478

BUREAU OF RECLAMATION PROCEDURES FOR PREDICTING SEDIMENT YIELD,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 02J.
W73-12479

COMPUTER DETERMINATION OF CRITICAL DEPTH CONTROL POINTS IN OPEN CHANNEL FLOW,
Southampton Univ. (England).
For primary bibliographic entry see Field 08B.
W73-12483

A COMPARISON OF RATES OF WATER LOSS THROUGH TRANSPIRATION OF SEVERAL SOUTHERN NEW MEXICO PHREATOPHYTE SPECIES,
New Mexico State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 02D.
W73-12497

A TOPOLOGICALLY OPTIMUM RIVER SAMPLING PLAN FOR SOUTH CAROLINA,
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W73-12498

TRITIUM MEASUREMENT OF NATURAL WATERS ON OAHU, HAWAII: A PRELIMINARY INTERPRETATION (SAMPLING PERIOD: JULY 1969 TO JUNE 1970),
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 05A.
W73-12499

CLIMATOLOGY OF RAINFALL PROBABILITIES FOR OAHU, HAWAII,
National Weather Service, Honolulu, Hawaii. Pacific Region.
For primary bibliographic entry see Field 02B.
W73-12587

COMPUTER MODELS OF DELTA GROWTH DUE TO SEDIMENT INPUT FROM RIVERS AND LONGSHORE TRANSPORT,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 02J.
W73-12592

HORTON'S 1945 STUDY: A CARTOBIBLIOGRAPHY,
Indiana Univ., Bloomington. Dept. of Geography.
M. C. Roberts, and D. A. Cobb.
Geological Society of America Bulletin, Vol 84, No 8, p 2733-2735, August 1973. 1 tab, 1 ref.

Descriptors: *Maps, *Hortons law, *Bibliographies, *Geomorphology, Topography, Terrain analysis, Drainage patterns (Geologic).

All the topographic maps used in Horton's classic 1945 paper are listed. Two obstacles face the researcher in attempting to use Horton's data. In the first place, all of the maps used by Horton have either been revised, replaced by large-scale maps, or are out of print (therefore, current U.S. Geological Survey indexes of topographic maps are of little value because they list only those quadrangles presently available). The second obstacle is that in the paper Horton refers to drainage basins and other physical features for which he does not list the topographical map sources even though he uses them. These obstacles are removed by providing a complete list of all the topographic maps used in the study. (Knapp-USGS)
W73-12596

UPPER CHESAPEAKE BAY WATER QUALITY STUDIES, 1968-1971.
Environmental Protection Agency, Annapolis, Md. Field Office.
For primary bibliographic entry see Field 05A.
W73-12601

MATHEMATICAL MODELS IN ECOLOGY, PROCEEDINGS OF THE 12TH SYMPOSIUM.
For primary bibliographic entry see Field 06A.
W73-12653

MATHEMATICAL MODELING FOR ENVIRONMENTAL POLLUTION CONTROL,
Clemson Univ., S.C.
For primary bibliographic entry see Field 05G.
W73-12711

EVALUATION OF THE WATER RESOURCES OF LEMMON VALLEY, WASHOE COUNTY, NEVADA, WITH EMPHASIS ON EFFECTS OF GROUND-WATER DEVELOPMENT TO 1971,
Geological Survey, Reno, Nev.
For primary bibliographic entry see Field 04B.
W73-12718

HYDROGEOLOGY OF THE CARBONATE ROCKS, FREDERICK AND HAGERSTOWN VALLEYS, MARYLAND,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-12719

WATER QUALITY IN THE MIDDLE FORK FEATHER RIVER, CALIFORNIA, MAY 1970 THROUGH SEPTEMBER 1971,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 05A.
W73-12720

PREDICTION OF UNSTEADY SALINITY INTRUSION IN ESTUARIES: MATHEMATICAL MODEL AND USER'S MANUAL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02L.
W73-12728

HANDBOOK OF FISH DISEASES FOR VETERINARIANS AND BIOLOGISTS,
For primary bibliographic entry see Field 05C.
W73-12813

THE DEVELOPMENT OF A REGIONAL SYSTEMS ORIENTED WATER MANAGEMENT MODEL: A TOOL FOR POLICY ANALYSIS,
Case Western Reserve Univ., Cleveland, Ohio. Systems Research Center.
For primary bibliographic entry see Field 06A.
W73-12839

REAL-TIME INTERACTIVE INSTRUMENTATION,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 07A.
W73-12850

INSTRUMENTAL AND NUMERICAL CONSIDERATIONS FOR ON-LINE INTERPRETATION OF HIGH RESOLUTION MASS SPECTRAL DATA,
Wisconsin Univ., Madison. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W73-12874

HIGH SPEED A-D CONVERTERS IN A MEMORY TEST SYSTEM,
Inter-Computer Electronics, Inc., Lansdale, Pa.
J. J. Connolly, and M. Rosenbaum.
Computer Design, Vol 12, No 2, p 86, 88, 89, February 1973. 2 fig.

Descriptors: *Date transmission, *Data processing, Digital computers, Automation, Instrumentation, Mechanical equipment, Automatic control.
Identifiers: *Analog to digital converters, Digital sampling systems, On-line computers, Buffer memory systems, Data gathering systems, Computer memory.

A low repetition rate digital sampling system is described in which a buffer storage unit provides a reduction in data rate so that digital samples may be processed and analyzed by an on-line computer. This computer may be either a special-purpose digital processor, or a general-purpose device

wherein digital data sample analysis is accomplished by means of a software program. A block diagram is given of the memory data gathering system using an A-D converter. This system will take five samples of the sense amplifier output at 50-ns intervals, convert the analog value of each sample to a 6-bit digital number, and place these numbers in five storage buffers. The converter has a sampling rate capability of up to 20 million samples/s, accuracy of plus or minus 0.8 percent FS plus or minus 1/2 LSB, and is TTL compatible. A 4-bit delay code defines the 100-ns multiple that must elapse after acceptance of an external convert command before actual sampling of the sense amplifier output signal begins. (Holoman-Battelle)
W73-12891

A METHOD FOR HIGH SPEED BCD-TO-BINARY CONVERSION,
Bendix Corp., Kansas City, Mo.
L. C. Beougher.
Computer Design, Vol 12, No 3, p 53-59, March 1973. 6 fig, 11 ref.

Descriptors: *Methodology, Digital computers.
Identifiers: BCD to binary conversions, *Conversion systems, Computer memory, Converters.

The BCD-to-binary design proposed as a high speed coded number converter can translate an 8-digit BCD number into a 27-bit binary number in 60 ns. The method is sufficiently fast to complete the process within one computer memory cycle of any available digital computer. High speed conversion of the number provides assurance that the input data to the computer will be in binary form at any time computer instructions request it. The design architecture was implemented using Schottky-clamped TTL integrated circuits. A less costly configuration can be obtained by using standard TTL integrated circuits such as the 74181 arithmetic logic unit and 74182 carry-look-ahead generator but results in a sacrifice of conversion speed. When standard TTL logic circuits are used, the converter can be expected to convert an 8-digit BCD number into a 27-bit binary number in approximately 150 ns, which is sufficiently fast for many applications and provides a saving of initial component costs. (Holoman-Battelle)
W73-12892

BOOST A/D RATES WITH STAGGERED OPERATION,
Grumman Aerospace Corp., Moriches, N.Y.
H. Baluta.
Electronic Design, Vol 21, No 4, p 54-57, February 15, 1973. 5 fig, 1 tab.

Descriptors: Design criteria, *Rates, Interfaces, Timing, Design standards, Velocity.
Identifiers: *Digital to analog converters, *Conversion speed, Timing constraints.

The operation of two interleaved a/d converters is discussed in order to clarify the details of interface circuit requirements versus the number of converters used. Conversion speed is doubled by the interconnection of two converters; however, external timing constraints limit the attainable speeds. (Holoman-Battelle)
W73-12893

AN APPROACH TO HYDROGEOLOGIC INVESTIGATIONS OF RIVER ALLUVIUM BY THE USE OF COMPUTERIZED DATA PROCESSING TECHNIQUES,
Oklahoma State Univ., Stillwater. Dept. of Geology.
For primary bibliographic entry see Field 02A.
W73-12942

FLOW TO WELLS NEAR STREAMS IN THE PRESENCE OF DELAYED YIELD FROM STORAGE AND ANALYSIS OF PUMPING TEST DATA,
Bulgarian Academy of Sciences, Sofia. Geological Inst.
For primary bibliographic entry see Field 04B.
W73-12943

SOURCES OF DATA FOR EVALUATION OF SELECTED GEOTHERMAL AREAS IN NORTHERN AND CENTRAL NEVADA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04B.
W73-12947

A HYDROGRAPHIC ATLAS OF LARGER NORTH CAROLINA SOUNDS,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
For primary bibliographic entry see Field 02L.
W73-12948

HYDROLOGIC RECORDS FOR LAKE COUNTY, FLORIDA: 1971-72,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02E.
W73-12949

CLASSIFICATION OF THE COASTAL ENVIRONMENTS OF THE WORLD: PART II. AFRICA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 02L.
W73-12950

REPORTS FOR CALIFORNIA BY THE GEOLOGICAL SURVEY WATER RESOURCES DIVISION,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02A.
W73-12953

PUBLICATIONS OF WATER RESOURCES INVESTIGATIONS IN COLORADO AND SELECTED PUBLICATIONS PERTAINING TO COLORADO.
Geological Survey, Denver, Colo. Water Resources Div.
For primary bibliographic entry see Field 02A.
W73-12954

08. ENGINEERING WORKS

8A. Structures

STONE AND WOODCHIP MULCHES FOR EROSION CONTROL ON CONSTRUCTION SITES,
Agricultural Research Service, Lafayette, Ind.
For primary bibliographic entry see Field 04D.
W73-12463

STRENGTH ANALYSIS OF CORNER COLUMN-SLAB CONNECTIONS,
Calgary Univ. (Alberta).
E. R. F. Zaghlool, and H. A. R. de Paiva.
J Struct Div, Am Soc Civ Eng, Vol 99, No ST1, p 53-70, Jan 1973. 3 fig, 2 tab, 27 ref, 3 append.

Descriptors: *Columns, *Slabs, *Structural analysis, Reinforced concrete, Shear strength, Structural engineering, Mohr envelope, Mathematical models, Bibliographies, Structural members.
Identifiers: Foreign studies, *Structural concrete, Supports, Bending moments, Plates, Torsion, Axial loads, Ultimate strength design, Theoretical analysis, Comparative studies.

An analytical method is presented for predicting strength of a corner column-slab connection in a flat plate structure subjected to bending moments or combined bending and axial load through the column stubs. The column side to the effective slab depth ratio, r/d, concrete and steel properties, steel configuration near the column-slab interface, and the moment to shear ratio are considered. The ultimate strength method of analysis for the reinforced concrete elements is based on the assumption of an idealized mode of failure. Flexural, torsional, and shear resistance of the idealized slab sections framing into the column was based on recent research into torsional and shear strength of beams. Equilibrium and compatibility are satisfied at ultimate load and the concrete in the compression zone above the head of the failure crack must reach some critical stress condition. Basic assumptions used in the method are discussed and the derivation presented. Validity was determined from comparisons of theoretical predictions with available test results; excellent correlation was obtained. Recommendations for application and a numerical example are given. (USBR)
W73-12465

WELDING OF A NORMALIZED HIGH STRENGTH LOW ALLOY PLATE STEEL OF STRUCTURAL QUALITY,
United States Steel Corp., Monroeville, Pa. Applied Research Lab.
For primary bibliographic entry see Field 08G.
W73-12466

HEURISTIC RANKING AND PRIORITIZING UNDER SUBJECTIVE CONDUCTIONS,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 06B.
W73-12470

HYDROLOGICAL RESERVOIR DESIGN USING BASIC SYSTEMS THEORY TECHNIQUES,
Lahmeyer International G.m.b.H., Frankfurt am Main (West Germany).
F. Fahlbusch, F. G. Rohde, and T. C. Muir.
Water Power, Vol 25, No 1, p 18-24, Jan 1973. 7 fig, 1 tab, 19 ref.

Descriptors: *Reservoir storage, *Rainfall-runoff relationships, *Hydrograph analysis, *Reservoir design, Rainfall, Hydrographs, Computer programs, Reservoir operation, Bibliographies, Runoff, Streamflow, Probability, Economic feasibility, Benefit-cost ratios, Model studies.
Identifiers: *Reservoir capacity, Flood hydrographs, Stochastic models, Computations.

A simple approach is presented for solving the problem of designing adequate reservoir storage capacity with available data consisting of a lengthy record of monthly rainfall and a short record of monthly runoff. The procedure permits the synthesis of long streamflow sequences without encountering the problems associated with selection and fitting of suitable models to observed runoff series. This approach is particularly applicable in developing countries where data available is inadequate. Three principal model components used are: (1) COR, rainfall-runoff model, (2) TSA, time series analysis of observed monthly rainfall sequence (synthesis of a long rainfall series), and (3) RES, simulation of reservoir operation. Basic premises and mathematical operations of these components are presented. The models were applied to several river systems and the results compared with observed streamflow data. Experience shows that the required reliability of the target withdrawal is an important factor in determining necessary storage. For a given draft, particularly one approaching the mean inflow, the required storage is extremely sensitive to reliability. For a given reliability, increases in target withdrawal require increasingly larger increases in storage. (USBR)
W73-12471

STRESSES IN THE BODY AND FOUNDATIONS OF PRESTRESSED DAMS,
Roorkee Univ. (India).
R. S. Varshney.
Water Power, Vol 24, No 12, p 445-454, Dec 1972. 10 fig, 3 tab, 14 ref.

Descriptors: Dam construction, *Prestressing, *Stress analysis, *Dam design, Dam foundations, Dams, Arch dams, Concrete dams, Uplift pressure, Hydrostatic pressure, Anchors, Stress distribution, Buttress dams, Gravity dams, Rock foundations, Shear strength, Grouting, Elastic theory, Prestressed concrete.
Identifiers: India, Foreign studies, *Dam stability, Construction methods, Hydraulic structures, Stressing cables, Stress distribution.

Since the first application of the prestressing technique to Cheurfas Dam, Algeria, in 1937, use of cable prestressing in dams has grown rapidly. The technique has been applied successfully to strengthening and raising numerous old dams and to construction of several new dams. To design the most economical sections, an outline of prestressing techniques in dam construction and the analysis of stresses in the dam and the foundation are presented. Studies using the theory of elasticity show that the prestress load is effective for economical design of a dam up to a height of about 80 m for a load of 200 metric tons per meter. Maximum spacing of anchors may be limited to 6.0 m and should be located about 1.5 m from the upstream face. With constant prestress force, horizontal tensile stress will decrease as the depth of the anchorage increases, but with the same depth, cracks may appear with higher prestressing force. Stress coefficients for different locations in the foundation for the internal concentrated load are tabulated. Actual stresses in metric tons per meter squared can be calculated by multiplying the coefficients by the prestressing forces in metric tons per meter and dividing by the depth of anchor d in meters. (USBR)
W73-12475

RESERVOIR-YIELD ESTIMATION PROCEDURES,
British Columbia Univ., Vancouver.
For primary bibliographic entry see Field 04A.
W73-12478

HIGH STRENGTH BOLTED GALVANIZED JOINTS,
Carleton Univ., Ottawa (Ontario).
For primary bibliographic entry see Field 08G.
W73-12489

STRESS DISTRIBUTION AROUND A TUNNEL SITUATED IN A LAYER UNDER THE ACTION OF GRAVITY,
National Technical Univ., Athens (Greece).
For primary bibliographic entry see Field 08E.
W73-12490

MATHEMATICAL SIMULATION OF THE TURBIDITY STRUCTURE WITHIN AN IMPOUNDMENT; HYDRAULIC LABORATORY INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 08B.
W73-12562

WAVE DAMPING EFFECTS OF FIBROUS SCREENS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W73-12564

OUTLET WORKS STILLING BASIN FOR TALLAHALA DAM, TALLAHALA CREEK, MISSISSIPPI; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 08B.
W73-12568

SELECTIVE WITHDRAWAL FROM MAN-MADE LAKES, HYDRAULIC LABORATORY IVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 04A.
W73-12569

NAVIGATION CHANNEL IMPROVEMENT, GASTINEAU CHANNEL, ALASKA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
F. A. Herrmann, Jr.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-72-9, November 1972. 46 p, 8 tab, 68 photo, 49 pl.

Descriptors: *Channel improvement, *Hydraulic models, *Shoals, *Alaska.
Identifiers: *Navigation channels, *Gastineau Channel (Alas).

A model study was conducted to determine the best means of resolving the shoaling problem in the Gastineau Channel, Alaska. The model, constructed to linear scale ratios of 1:500 horizontally and 1:100 vertically, reproduced about 7 miles of Gastineau Channel from Fritz Cove on the west to 1 mile north of Juneau, Alaska, on the east. It was equipped to reproduce and study prototype tides, tidal currents, freshwater inflow, and shoaling. The shoaling tests were conducted using granulated plastic to simulate the natural sediments, and a technique was developed to properly reproduce the prototype shoaling pattern and distribution. It was determined from the model tests that any one of several impermeable dikes with a top elevation above high water and located along the north side of the navigation channel would reduce shoaling by 80 to 85 percent. Diversion of Fish Creek away from the navigation channel would result in an additional 5 percent reduction. The shortest dike tested (plan 4) was 17,250 ft long, and the shoaling reduction for this plan was essentially the same as that for longer dikes. (WES)
W73-12571

EFFECTS OF SUBMERGED SILLS IN THE ST. CLAIR RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 08B.
W73-12572

REPORT ON ARKANSAS VALLEY CONDUIT FOR SOUTHEASTERN COLORADO WATER CONSERVANCY DISTRICT, FOUR CORNERS REGIONAL COMMISSION AND U.S. BUREAU OF RECLAMATION.
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 04A.
W73-12577

SPILLWAY FOR OAKLEY DAM, SANGAMON RIVER, ILLINOIS-APPENDIX A: TYPE 2 (REVISED) SPILLWAY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
E. S. Melsheimer.
Available from NTIS, Springfield, Va 22151, as AD-754 535 Price $3.00 printed copy; $1.45 microfiche. Technical Report H-70-13, December 1972. 17 p, 1 fig, 9 plate, 4 photo.

Descriptors: *Spillways, *Dams, *Illinois, Hydraulic models, Design flow, Discharge (Water).
Identifiers: *Oakley Dam (Ill).

The plans for the Oakley Dam project, Illinois, were changed by modification of the spillway design. These modifications, involving lowering the elevation of the spillway crest, decreasing the length of the spillway, and extending the gate piers upstream were tested in a hydraulic model. Approach flow conditions with the revised spillway installed were generally satisfactory, although the decrease in spillway height increased the velocity along the abutment wraparounds and increased drawdown and contraction in the end bays of the spillway. The capacity of the spillway was adequate; the maximum discharge of 150,000 cfs was passed at a pool elevation of 661.0 with the original abutments and 661.6 with the proposed design abutments. With the spillway reduced in elevation, better energy dissipation was obtained with two rows of baffle piers on the downstream portion of the apron (type 8 basin) rather than with the chute blocks and one row of baffles with the orininal spillway (type 6 basin). A flow of about 35,000 cfs could be passed through the two bridges below the structure without overtopping the roadway. Riprap having an average stone size of 400 lb was required for a distance of 60 ft downstream of the stilling basin; 15-lb stone should suffice for the rest of the exit channel. Additional protection should be provided at the abutments of the bridge. (Knapp-USGS)
W73-12582

CONSTRUCTION COSTS OF WATER SUPPLY AND SEWAGE NETWORKS IN POLAND--19-61-1970,
Institute of Public Utility Services, Warsaw (Poland).
For primary bibliographic entry see Field 06C.
W73-12703

DIAMOND-BIT RESEARCH PROVIDES BASIC DRILLING PARAMETERS,
Mobil Research and Development Corp., Dallas, Tex.
For primary bibliographic entry see Field 08B.
W73-12764

CATHODIC PROTECTION FOR COATED STEEL PIPELINES,
Colorado Springs Dept. of Public Works, Colo. Water Div.
For primary bibliographic entry see Field 08G.
W73-12765

WELL LOGS CAN INDICATE FORMATION DRILLABILITY,
California Univ., Berkeley.
For primary bibliographic entry see Field 08E.
W73-12769

GUIDE SPECIFICATION FOR CHEMICAL GROUTS.
American Society of Civil Engineers, New York. Committee on Grouting.
For primary bibliographic entry see Field 08G.
W73-12782

8B. Hydraulics

COMPUTING BACKWATER AT OPEN CHANNEL CONSTRICTIONS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
J. W. H. Barrett, and G. V. Skogerboe.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY7, Paper 9841, p 1043-1056, July 1973. 9 fig, 2 tab, 10 ref, append. AID Contract csd-2460.

Descriptors: *Flow profiles, *Backwater, *Open channel flow, Non-uniform flow, Subcritical flow, Flow around objects, Bridges.
Identifiers: Open channel constrictions.

A subcritical (submerged) flow analysis for open channel constrictions was modified to provide an improved technique for computing the backwater resulting from constrictions. Application of the method to results from model studies provides a more accurate prediction of the effects of a contraction on open channel flow than the methods currently in use. Of particular advantage is the applicability of the proposed technique to any flow condition or regime and its independence of channel slope. (Knapp-USGS)
W73-12415

EXTREME ROUGHNESS OF NATURAL RIVER CHANNEL,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
H. J. Leutheusser, and W. O. Chisholm.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY7, Paper 9831, p 1027-1041, July 1973. 13 fig, 2 tab, 4 ref, append.

Descriptors: *Roughness (Hydraulic), *Stage-discharge relations, Discharge (Water), Backwater, Open channels, Open channel flow, Channel improvement, Hydraulic design.

In the hydraulic design of a channel improvement scheme, special attention is focused on the synthesis of the stage-discharge relationship for the downstream end of the improvement reach. In the absence of more directly applicable information, the design of the tail-water rating curve is based on the roughness characteristics of the river channel. Roughness is deduced from a combination of the high-water mark and flood flow which were recorded during the occurrence of a hurricane over the watershed. Manning roughness coefficient is 0.225 for the channel reach under consideration. This value is larger than corresponding predictions made on the basis of conventional methods for estimating n. (Knapp-USGS)
W73-12416

LONG WAVE PROPAGATION IN IDEALIZED ESTUARY,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02L.
W73-12417

FINAL ENVIRONMENTAL STATEMENT: SMALL BEACH EROSION CONTROL PROJECT, BROADKILL BEACH, DELAWARE.
Army Engineer District, Philadelphia, Pa.

Available from NTIS, Springfield, Va. 22151 as EIS-73-0225-F - Price $3.00 printed copy; $1.45 microfiche. February 1972. 17 p, 1 map.

Descriptors: *Beach erosion, *Erosion control, *Coastal engineering, *Delaware, Project planning, Recreation facilities, Berms, Shore protection, Ocean waves, Storms, Tidal effects.
Identifiers: *Broadkill Beach (Del), *Environmental Impact Statements.

The summer resort of Broadkill Beach is located in Sussex County on Delaware Bay about three miles northwest of Lewes, Delaware. The purpose of the proposed project is to protect the shoreline of Broadkill Beach by providing beach erosion control measures that would result in a recreational beach adequate to satisfy the present and future needs of the area. The problem at Broadkill Beach is the erosion of the beach along Delaware Bay caused by wave action during storms. As a result of this erosion, much recreational beach has been lost, and shore properties are now susceptible to damage from extreme tides and wave action. The plan of improvement, considered most suitable for Broadkill Beach consists of improving 4,500 feet of beach, extending from a point 2,700 feet north of the access road (Route 16) to a point 1,800 feet south of that road by placement of approximately 110,000 cubic yards of suitable sand to provide a berm 50 feet wide at an elevation 10 feet above mean low water, erection of 4,500 feet of sand fence and periodic nourishment of the beach by artificial placement of approximately 40,000 cubic yards of suitable sand every four years. Suitable material for initial fill and periodic nourishment is available from an offshore borrow source. (Woodard-USGS)
W73-12430

EVALUATION OF HYDRAULIC PROPERTIES OF ROCK MASSES INFLUENCED BY MAJOR HETEROGENEITIES,
Golder, Brawner and Associates Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 08E.
W73-12468

GENERALIZED DISCHARGE RELATIONS FOR CUTTHROAT FLUMES,
Colorado State Univ., Fort Collins.
G. V. Skogerboe, R. S. Bennett, and W. R. Walker.
J Irrig Drain Div, Am Soc Civ Eng, Vol 98, No IR4, p 569-583, Dec 1972. 11 fig, 2 tab, 5 ref, 2 append.

Descriptors: Irrigation, Open channel flow, *Discharge measurement, *Water measurement, Drainage, Flow measurement, Flumes, Design criteria, Hydraulic structures, Subcritical flow, Laboratory tests, Discharge coefficient, Fluid mechanics.
Identifiers: *Cutthroat flumes, Hydraulics, Measuring instruments, Parshall flumes, Submerged flow, Free flow.

The Cutthroat flume, a new flume designed to measure flows in flat gradient streams, is simple and economical, operates well under submerged flow conditions, and has low head loss. Initial investigations of the flume were limited to one length of 9 ft with throat widths ranging from 1 to 6 ft, and therefore, were not geometrically similar. To obtain generalized discharge rating curves for geometrically similar flumes, a group was rated under both free flow and submerged flow conditions. Twelve flumes were used in the study–3 flumes lenghts, 1.5, 3, and 4 ft, with 4 different throat widths for each length. In addition, the flume sizes were selected to permit correlations with the initial Cutthroat flume studies. To obtain the most accurate rating, based upon analysis of data scatters of laboratory ratings, flumes with throat width to length ratios between 0.1 and 0.4 are recommended. Because of scale effects, flumes less than 3 ft long are satisfactory only for free flow operations. Experimental flume dimensions are given; free flow and submerged flow coefficients and exponents are tabulated. (USBR)
W73-12474

COMPUTER DETERMINATION OF CRITICAL DEPTH CONTROL POINTS IN OPEN CHANNEL FLOW,
Southampton Univ. (England).
K. V. H. Smith.
Inst Civ Eng Proc, Part 2, Vol 53, p 461-470, Dec 1972. 5 fig, 4 ref.

Descriptors: *Open channel flow, Control structures, *Water surface profiles, *Hydraulics, Computer programs, Water control, Discharge (Water), Gradually varied flow, Fluid mechanics, Open channels, Hydraulic structures, Momentum equation, Equations, Foreign research.
Identifiers: Great Britain, Prismatic channels, *Critical depth, Water surface profiles, Calculations, *Critical velocity.

In open channels with variable geometry, or with discharge varying along the length of the channel, determining the location of a critical depth control point is difficult. A simple computer procedure is presented to locate a critical depth control as a point in a channel where a singularity occurs. With the described procedure, control points can be obtained for a wide range of conditions in open channel flow. This procedure is a modern equivalent of the transition profile method applied to prismatic and nonprismatic channels considering lateral inflow. The prismatic channels have a constant cross section with a defined (although not necessarily constant) invert slope. The nonprismatic channels have a variable cross section, including natural channels not having defined inverts. Gradually varied flow equations and conditions for a critical control for both prismatic and nonprismatic channels are discussed. Computer solutions for both kinds of channels are illustrated. Determining a critical depth control point in a nonprismatic outlet channel from a reservoir is exemplified. (USBR)
W73-12483

CHENA RIVER LAKES PROJECT, ALASKA, PROBLEMS RELATING TO CHANNEL DEVELOPMENT, EROSION, AND BANK AND LEVEE PROTECTION,
Committee on Channel Stabilization (Army).
C. P. Lindner, and G. B. Fenwick.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, March 1973. 24 p, 3 pl.

Descriptors: *Channel improvement, *Erosion, *Flood protection, Bank protection, *Levees, Shoals, *Alaska.
Identifiers: *Chena River (Alas), *Tanana River (Alas), Fairbanks (Alas).

This report is published by the Committee on Channel Stabilization primarily in furtherance of their objective, with respect to channel stabilization, to provide, at the request of field offices, advice on design and operational problems; and to review and evaluate pertinent information and disseminate results thereof. Opinions are given on channel stabilization problems involved in evaluating the several alternate plans for regulating the Chena and Tanana Rivers to provide flood protection for Fairbanks, Alaska. Some of the questions asked the Committee, and answered, were: How successfully can the river be diverted by the method outlined; Is location of the diversion satisfactory; How would the diversion affect the river downstream; What levee maintenance problems are likely to be encountered; Is levee design for Tanana River (braided river) the best possible for this type stream; Is there prior experience with levee construction or bank stabilization on large braided rivers; Will borrowing from the river have an effect on future erosion; What problems are associated with maintaining the pilot channel after construction. (Garrett-WES)
W73-12559

REFLECTION CHARACTERISTICS OF SCREEN WAVE ABSORBERS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
G. H. Keulegan.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Research Report H-73-3, April 1973. 42 p, 17 tab.

Descriptors: *Hydraulic models, *Screens, Waves (Water).
Identifiers: *Screen wave absorbers, *Wave reflection, *Wave absorbers.

Two expressions are derived for the reflected waves from a wave absorber consisting of small mesh screens with the pieces in parallel arrangement and equal distance apart. In deriving one of the expressions, it is assumed that one part of the

observed reflection is due to a reflection from the frontal part of the absorber and the remaining part, to a reflection from the rigid wall at the back. The agreement between observation and evaluation is fair. The other expression is derived empirically. The formula obtained relates the observed reflection from an absorber to the transmission that would have occurred had the wave absorber been used as a filter. The law derived is quadratic and resembles the form given by Goda and Ippen. (WES)
W73-12561

MATHEMATICAL SIMULATION OF THE TURBIDITY STRUCTURE WITHIN AN IMPOUNDMENT; HYDRAULIC LABORATORY INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
D. G. Fontane, J. P. Bohan, and J. L. Grace, Jr.
U.S. Army Engineer Waterways Experimental Station, Vicksburg, Mississippi, Research Report H-73-2, March 1973. 12 p, 6 tab, 3 pl.

Descriptors: *Mathematical models, *Impoundments, *Turbidity, Computer models, Forecasting, Impoundment, Model studies, Simulation analysis.

The turbidity structure of an impoundment was simulated using a mathematical model capable of simulating physical and chemical characteristics of an impoundment. Turbidity was handled as a conservative chemical substance. The model was used to predict the thermal and turbidity structures of an existing impoundment and was verified with observed data. The model was then used to predict the turbidity structure of a proposed impoundment. The effectiveness of selective withdrawal and, in particular, of a low-level outlet in controlling the turbidity structure of an impoundment was demonstrated. (WES)
W73-12562

WAVE TRANSMISSION THROUGH ROCK STRUCTURES; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulic Lab.
G. H. Keulegan.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Research Report H-73-1, February 1973. 56 p, 22 tab.

Descriptors: *Hydraulic models, *Waves (Water), Breakwaters, Jetties.
Identifiers: *Rock structures, Wave transmission.

Application of the energy method leads to a theoretical expression of the coefficient of transmission through a prismatic structure, constructed from rocks of uniform size, for long waves traversing the structure. When the dissipation in the voids is due partly to turbulent forces, the transmissions are expressed by a power formula. The formula is modified by a parametric factor to respond to the conditions met with in the ordinary model studies of the shorter waves. The factor form is determined from observations made with waves of varying periods. The relation of the adapted formula to the resistance of the structures for steady flow is shown. With the reflections not being amenable to an analytical treatment, test results are consolidated in a single curve, irrespective of the rock sizes, with the porosity remaining constant. (WES)
W73-12563

WAVE DAMPING EFFECTS OF FIBROUS SCREENS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
G. H. Keulegan.
U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Research Report H-72-2, September 1972. 82 p, 18 tab.

Descriptors: *Hydraulic models, *Screens, Waves (Water).
Identifiers: *Wave attenuation, *Fibrous materials.

Expressions are derived for the damping of essentially translatory waves by screens prepared from fibrous materials such as aluminum wool, rubberized hair, and polyurethane foam. The derivations involve either the resistance coefficients or the permeabilities of these materials and these are individually determined. It is found that with the aluminum wool the damping is exponential and yields expressions admitting logarithmic decrements. A comparision is made with the Biesel theory of decay in porous media. With the foams the damping is also exponential; on the other hand, with the rubberized hair the damping is best described in terms of a power formula. (WES)
W73-12564

EFFECTIVE HYDRAULIC ROUGHNESS FOR CHANNELS HAVING BED ROUGHNESS DIFFERENT FROM BANK ROUGHNESS; A STATE-OF-THE-ART REPORT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
R. G. Cox.
U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Miscellaneous Paper H-73-2, February 1973. 12 p, 2 tab, 9 pl, 3 app.

Descriptors: *Roughness (Hydraulic), *Open channel flow, *Flow resistance, Roughness coefficient, Mannings equation, Beds, Banks, *Reviews.

This report summarizes two numerical studies, one laboratory experimental study, and one analytical study of flow resistance in rectangular channels having one type or degree of boundary roughness on the bed and a second type or degree of roughness on the sidewalls. The numerical study showed that usual procedures for estimating resistance coefficients for channels of this type are not adequate. The laboratory study indicated that the relations between the effective Manning's n, the sidewall Manning's n, the bed Manning's n, and the channel geometry could be established empirically by extensive laboratory testing. The analytical study proved that laboratory studies using a smooth surface for one of its boundaries had little application to practical design problems. It also showed that the best solution to the problem probably would result by use of hydraulic roughness values to describe the boundary surfaces. The study showed that relatively large errors in estimating the hydraulic roughness effect only minor errors in capacity design. (WES)
W73-12565

EFFECTS OF PROPOSED DOCK EXPANSION AT NEWPORT NEWS ON TIDES, CURRENTS, AND SHOALING; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulic Lab.
R. A. Boland, Jr.
Sponsored by Newport News Shipbuilding and Dry Dock Company, Newport News, Virginia. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Miscellaneous Paper H-72-10, August 1972. 9 p, 3 tab, 13 photo, 9 pl.

Descriptors: Currents (Water), *Docks, *Hydraulic models, *Shoals, *Tides, *Virginia.
Identifiers: *Navigation channels, *Newport News, James River.

The existing comprehensive fixed-bed model of James River was used for tests to determine effects of first and second phases of proposed shipyard expansion of Newport News Shipbuilding and Dry Dock Company facilities on tides, currents, and adjacent ship channel shoaling. Test results consist of comparable measurements of tide heights, current velocities, and shoaling quantities for existing and proposed conditions. Analysis of results of tests led to conclusions that proposed expansion at Newport News would have no significant effects on current velocities or tidal heights. Maximum increases in current velocities caused by proposed expansion occurred in and adjacent to the navigation channel at bottom depth at sta 2A and 2 where ebb current strengths were increased from about 1.0 to 2.0 fps. Current directions in adjacent reach of James River navigation channel should be improved somewhat after completing the second phase. Shoaling rates in areas adjacent to the dock showed increases ranging from 1.5 to 2.5 times the rates with base conditions installed, with maximum shoaling rate occurring with plan 2 installed. However, quantities involved are small and indicated increases should not be considered a significant deterrent to proposed expansion. (WES)
W73-12566

SEA-LAND NAVIGATION STUDIES; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
W. H. Bobb.
Sponsored by Sea-Land Service, Inc., and Port of New York Authority. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Miscellaneous Paper H-72-9, August 1972. 14 p, 4 tab, 1 photo, 5 pl, 1 app.

Descriptors: *Hydraulic models, Dredging, *New York.
Identifiers: *Containerships, *Navigation channels, Newark Bay (NY) Kill Van Kull (NY), Arthur Kill (NY), *Ship models.

A fixed-bed undistorted-scale model of a portion of Newark Bay, Kill Van Kull, and Arthur Kill and a remotely controlled model of Sea-Land's new SL-7 containership were constructed to a scale of 1:100 and used to determine the adequacy of proposed dredging to provide docking and maneuvering areas to familiarize prospective captains and pilots with the handling characteristics of the new type ship. The Sea-Land model was equipped to reproduce steady state flows in flood or ebb directions and an erratic wind field from three directions. The SL-7 required major portion of the channel in Kill Van Kull and all of it in Newark Bay. Addition of the wind field greatly increased difficulties in rounding Bergen Point, passing through the bridge span, and approaching the Sea-Land wharf. Results of tests in New York Harbor model indicate that shoaling in presently maintained areas south of the bridge will be reduced when the maneuvering area is dredged, but shoaling in the maneuvering area and adjacent channel areas will be greatly increased. None of the plans tested had any significant effect on hydraulic conditions in the problem areas. (WES)
W73-12567

OUTLET WORKS STILLING BASIN FOR TALLAHALA DAM, TALLAHALA CREEK, MISSISSIPPI; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
N.R. Oswalt.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-73-5, April 1973. 8 p , 1 tab, 4 photo, 5 pl.

Descriptors: *Eddies, *Hydraulic models, *Outlet works, Flow, *Mississippi.
Identifiers: *Tallahala Dam (Miss), *Stilling basins.

Tests were conducted on 1:16.6-scale model of Tallahala Creek outlet works stilling basin to determine if eddies or other undesirable flow conditions would exist in the stilling basin. Basin consisted of a horizontal apron 90 ft long and 22 ft wide and was connected to 10-ft-diam outlet by a 56-ft-long transition with sidewalls flared 8.67 on 1. Eddies occurred in original design basin with discharges of 800 cfs or less and expected tailwater elevations. Eddies were eliminated by revising floor and walls of flared transition. Sidewall flare was changed from 8.67 on 1 to 11.83 on 1 and the IV-on-8H downsloping floor was changed to IV-on-6H upslope for a rise of 4 ft and then a downslope with curve following equation $x2 \pm 238y$. Floor was sloped down laterally 1 ft from transition center line to each wall. Spray off baffle blocks occurred with design discharge and minimum tailwater with stilling basin as originally designed. Height of baffle blocks was increased and additional row of blocks was added to prevent this type of action. (WES)
W73-12568

SHOALING CONDITIONS, ST. LOUIS HARBOR, MISSISSIPPI RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
J. J. Franco.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-72-7, November 1972. 18 p, 17 pl.

Descriptors: *Shoals, *Harbors, *Hydraulic models, Mississippi River, Sediment transport, *Missouri.
Identifiers: *Chain of Rocks Canal, *St. Lous Harbor (Mo).

Purposes of study were to determine causes of shoaling in harbor and docking areas and to develop plans to eliminate or reduce shoaling in these areas and in lower entrance to Chain of Rocks Canal. Model was a movable-bed type, reproducing reach of Mississippi River and adjacent overbank areas between miles 191.0 and 169.9. Some of the results indicated: Shoaling along city front can be expected along the convex side of bends in streams carrying sediment. Conditions in the city front reach are also affected by movement of sediment from the Missouri River and by differences between channel characteristics in reach along city front and those in reach upstream. Improvement along city front can be obtained by closing channel along left side of Mosenthien Island, by extending training structures into channel on right side of Mosenthien Island and channel along city front, and by constructing a lock and dam structure downstream of the harbor area. Shoaling in lower entrance to Chain of Rocks Canal during low flows is caused by sudden expansion in channel width and movement of bottom currents towards approach channel past the end of the trail dike. (WES)
W73-12570

NAVIGATION CHANNEL IMPROVEMENT, GASTINEAU CHANNEL, ALASKA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 08A.
W73-12571

EFFECTS OF SUBMERGED SILLS IN THE ST. CLAIR RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
J. J. Franco, and J. E. Glover.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-72-4, August 1972. 18 p, 5 tab, 7 photo, 20 pl.

Descriptors: *Navigation, *Hydraulic models, Lake Huron, *Michigan.
Identifiers: *Submerged sills, Navigation conditions, *St. Clair River (Mich).

Low lake level experienced in Lake Huron during the early 1960's had a detrimental economic impact on the area. To increase water level in Lake Huron, plans for using submerged sills at the head to St. Clair River were proposed. A fixed-bed, 1:60-scale model was used, reproducing approximately 2.8 miles of St. Clair River and a small section of the lower end of Lake Huron. With the sill arrangements developed, water levels in Lake Huron could be raised by up to 0.75 ft without adversely affecting navigation conditions. A type of sill that would facilitate construction and reduce construction cost could be used without any significant loss in effectiveness. Shoaling along the Canadian shore can be attributed to movement of sediment into that side of the river, the natural tendency for shoaling on the convex side of a river bend, and the effects of the eddy currents. Sills would tend to reduce the size of the eddy and the tendency for shoaling. Some deposition of sediment could occur along the left ends of some of the sills, but any of effectiveness resulting from deposition would be small. (WES)
W73-12572

ESTUARINE NAVIGATION PROJECTS.
Committee on Tidal Hydraulics (Army), Washington, D.C.

Available from NTIS, Springfield, Va. 22151 as AD-756 133, Price $3.00 printed copy; $1.45 microfiche. Technical Bulletin No 17, January 1971. 253 p, 57 plates.

Descriptors: *Navigation, *Tidal waters, *Hydraulic engineering, *Projects, *Inland waterways, United States, Federal Government, Estuaries, Bays, Canals, Dredging, Tidal effects, Currents (Water), Saline water intrusion, Sediment transport, Channel improvement, Harbors, Project purposes, Programs, Reviews, Hydraulic design.
Identifiers: *Estuarine navigation projects (USA), Shoaling.

Information is presented on selected navigation projects in tidal waterways such as inlets, bays, tidal rivers, and canals. Included for each of the projects are description of the waterway and the Federal project, data on the tides, freshwater discharges from upland sources, currents, salinity intrusions, shoaling, and the dredging required to maintain the channels. Specific problems are identified (where applicable) together with statements of the status of solutions of the problems. Available reference sources are listed. The information should have value in the planning, design, and maintenance of projects in waterways having similar characteristics. The order of presentation of the selected projects is clockwise around continental United States, beginning in New England; in addition, one project in Alaska and one in Hawaii are included. (Woodard-USGS)
W73-12575

GRAYS HARBOR ESTUARY, WASHINGTON: REPORT 2. NORTH JETTY STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
N. J. Brogdon, Jr.
Available from NTIS, Springfield, Va 22151, as AD-748 813 Price $3.00 printed copy; $1.45 microfiche. Technical Report H-72-2, September 1972. 148 p, 2 fig, 122 plate, 5 photo, 4 tab, 1 ref.

Descriptors: *Coastal engineering, *Beach erosion, *Estuaries, *Jetties, *Washington, Harbors, Shore protection, Model studies, Ocean currents, Waves (Water), Tidal effects, Shoals, Sediment transport, Sands, Saline water intrusion, Forecasting, Planning, Evaluation, Navigation, Inlets (Waterways), Hydraulics, Flow characteristics.
Identifiers: *Grays Harbor Estuary (Wash).

This report is the second in a series to be published on the results of model tests on the Grays Harbor estuary, Washington, model conducted for the U.S. Army Engineer District, Seattle. The entrance to Grays Harbor is protected by two converging stone jetties that are about 1.23 miles apart at their outer ends. Between 1907 and 1914, the north jetty was constructed seaward from Point Brown for a distance of about 3.22 miles. The original top elevation was 8.0 ft mean lower low water (mllw). By 1933, the outer 7000 ft had deteriorated to mllw or lower. Between 1940 and 1942, the jetty was rehabilitated to within 850 ft of the original outer end with a top elevation of 16.0 ft mllw. By 1967 the outer 600 ft of the rehabilitated jetty was below mllw. The fixed-bed model of the Grays Harbor estuary was used to determine the effects of several plans for rehabilitation of the north jetty. Determinations were made of effects on hydraulic, salinity, shoaling, and dye dispersion characteristics. Test results consist of current velocity, tidal height, and salinity measurements; shoaling patterns in the entrance area; dye dispersion characteristics; and photographs of surface current patterns. A 650-ft extension to the north jetty would cause only insignificant local changes in current velocities and patterns in the entrance area. (Woodard-USGS)
W73-12581

MAINTENANCE OF THE HUDSON RIVER CHANNEL, NEW YORK, NAVIGATION PROJECT, (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, New York.

Available from NTIS, Springfield, Va. 22151, as EIS-NY-73-007-F; $3.50 printed copy; $1.45 microfiche. June 30, 1972. 12 p.

Descriptors: *Channel improvement, *Dredging, *Navigation, *Projects, *Hudson River, New York, New Jersey, Maintenance, Engineering, Environmental effects, Turbidity, Water quality, Ecology, Water pollution control, Reviews.
Identifiers: *Hudson River Channel, Spoil disposal, *Environmental Impact Statements.

The Hudson River Channel, New York, Navigation Project includes several phases that deal with environmental, economic, social, and safety aspects. Maintenance dredging of the Hudson River Channel is an existing Federal navigation project. The cahnnel is located in the Hudson River between New Jersey and New York City. The project was authorized by the River and Harbor Acts. It provides for: a channel 45 ft deep and 2,000 ft wide in the area of the Upper New York Bay to W. 40th Street, Manhattan, and 48 ft deep and 2,000 ft wide to 59th Street for a total length of approximately 6 miles; a channel, 40 ft deep for the full width of the river, extending from deep water in Upper New York Bay off Ellis Island to W. 59th Street, Manhattan, for a length of approximately 6 miles; and a channel, 30 ft deep, 750 ft wide, along the Weehawkin-Edgewater waterfront, for a length of 5 miles. (Woodard-USGS)
W73-12588

CONTROL OF UNDERSEEPAGE BY RELIEF WELLS, TROTTERS, MISSISSIPPI; APPENDIX K: 1969 PUMPING TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. C. Trahan.
Available from NTIS, Springfield, Va. 22151 as AD-756 208 - Price $3.00 printed copy; $1.45 microfiche. Technical Memorandum No 3-341, September 1970. 31 p, 5 fig, 8 plate, 3 tab.

Descriptors: *Seepage control, *Levees, *Mississippi River, *Underseepage, *Wells, Dewatering, Pumping, Water yield, Aquifers, Well data, Drawdown, Data collections, Hydrologic data, Engineering.

Identifiers: *Trotters (Miss), Relief wells.

The experimental relief well system installed in 1950 along the landside tow of the Mississippi River main line levee on the east bank at Trotters, Miss, (levee mile 54), is described in the main report to which this is an appendix. The well system was installed in order that information on the performance of relief wells over an extended period of time could be obtained. The relief well system consists of thirty 6-inch ID, wooden wells, on 50-ft centers, located parallel to, and 387 ft landward of the levee center line (just landward of the tow of the seepage berm). The well screens penetrate about 50% of the aquifer thickness and are surrounded by 6-inch-thick gravel filters. This report (Appendix K) presents well cleaning operations and pumping tests conducted in 1969. The well pumping test data were analyzed in order that the yields of the pump-tested wells could be compared with those obtained after installation. Photographs of well screens obtained in 1969 with the borehole TV camera are included for several selected wells. The specific yields for the 1950 pumping tests and all subsequent tests are tabulated. (Woodard-USGS)
W73-12597

SIMPLIFIED SOLUTION FOR DECREASING FLOW IN WELLS,
California Univ., Davis. Dept. of Irrigation.
G. Aron, and V. H. Scott.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 5, No HY5, p 1-12, September 1965. 8 fig, 2 tab, 5 ref, append.

Descriptors: *Aquifer charastics, *Hydraulics, Wells, *Mathematical studies.
Identifiers: Mathematical models, Mineral content, Piezometric surface.

The development of truly exact formulas or methods to describe the hydraulics of nonsteady groundwater flow is an extremely complex task. Even in the most sophisticated approaches, factors such as heterogeneity of the aquifer material, effect of mineral content on permeability, and lag in the response of piezometers to changes of the piezometric surface are neglected or highly simplified. Mathematical methods are used to demonstrate that even if the discharge, Q, from a well decreases with time, the drawdown h, at any time and at any distance from the well can be expressed by Jacob's formula. The proposed procedure should not result in an error of more than 5% to 10% in the computation of transmissability or drawdown, or 20% to 30% in the computation of the storage coefficient. (Campbell-NWWA)
W73-12759

SAND CONTROL - 3. CHEMICAL CONSOLIDATION,
Standard Oil Co. of California, San Francisco.
For primary bibliographic entry see Field 08G.
W73-12760

HERE'S A NEW SAND PACK METHOD,
Halliburton Services, Tulsa, Okla.
For primary bibliographic entry see Field 08G.
W73-12761

MICELLAR SOLUTIONS STIMULATE WELLS,
Amoco Production Co., Tulsa, Okla.
D. L. Dauben, and H. R. Froning.
Oil and Gas Journal, Vol 70, No 38, p 72-78, 83, September 1972. 6 fig, 3 tab, 3 ref, append.

Descriptors: Wells, *Oil wells, *Injection wells, Chemical reactions, Oil industry, *Water chemistry, *Surfacants.
Identifiers: *Well stimulation, Well redevelopment, *Fluid-flow rates, Thermodynamic equilibrium.

Micellar solution treatment of selected injection and production wells can improve fluid-flow rates by removing residual oil saturations, organic deposits, trapped water or emulsions from the vicinity of the well bore. Micellar solutions (also called microemulsions) are composed of a hydrocarbon, water, a surfacent and a cosurfacant. The surfacent and cosurfacent act as coupling agents to solubilize two otherwise immiscible liquids by encapsulating either water into oil or oil into water. Those solutions are homogeneous and single phase in appearance and displacing ability. Properly mixed they exhibit good miscibility with various crude oils and with water, low and high temperature stability, and an acceptable tolerance to salt (NaCl) content variations. Careful selection of the wells to be treated, consideration of the mixture to be used with respect to the intended purpose, volumes injected, and injection procedures are critical to treatment success. Key factors for the design, application and evaluation of micellar treatment are described. (Hunt-NWWA)
W73-12762

DIAMOND-BIT RESEARCH PROVIDES BASIC DRILLING PARAMETERS,
Mobil Research and Development Corp., Dallas, Tex.
T. B. Dellinger, and B. J. Livesay.
Oil and Gas Journal, Vol 70, No 38, p 86-90, 95, September 1972. 6 fig, 22 ref.

Descriptors: Drilling, *Well drilling, Wells, Rotary drilling, Drilling equipment, Analytical techniques, Computers, Hydraulics, *Regression analysis.
Identifiers: *Diamond drill bits, *Hydraulic lift, *Fluid velocity.

Diamond-bit drilling has developed through the years with very little technical or theoretical guidance. Although mining-type diamond coring can be traced back to 1862, oil field-type operations didn't begin until 1921. Since there was little knowledge of the relationships between factors controlling the drilling characteristics of diamond bits, a study was performed to supply some of these relationships. A comprehensive examination is presented of the fundamental relationships of penetration rate, bit weight, rotary speed, torque and flow rate, and hydraulic lift. Formulae are presented to relate penetration rate to various combinations of variables. (Hunt-NWWA)
W73-12764

LEACHING OF CEMENT FROM A CONCRETE PILE SECTION BY GROUNDWATER FLOW,
Cementation Co. Ltd., London (England).
For primary bibliographic entry see Field 08F.
W73-12766

RATIONAL DESIGN OF WELL SCREENS,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
S. P. Garg, and J. Lal.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 97A, No IR1, p 131-147, March 1971. 10 fig, 7 ref, 2 append.

Descriptors: *Aquifer characteristics, Permeability, *Hydraulics, Wells, Equipment, *Well screens, Design flow.
Identifiers: *Mathematical analysis, *Entrance velocity, Piezometric heads.

Optimum and economical utilization of ground water involves determination of the depth to which the hole should be bored, selection of a suitable well screen with or without gravel pack, and selection of a suitable pumping unit. While the techniques for boring a well have improved considerably and better screens, as well as pumps have evolved, the progress of improvements in well screen design to conform with the aquifer has been slow. The design of a well which involves the determination of the correct screen size, its length, number and character of openings is still based on empirical criteria. An analytical and experimental study of well screen behavior is presented. General equations describing the hydraulics of well screens are presented in which aquifer permeability, well-screen friction, and other factors have been considered. These equations agree with experimental results and criteria for the design of well screens are presented. (Hunt-NWWA)
W73-12771

BACK-SURGE TECHNIQUE IMPROVES WELL COMPLETIONS,
R. E. Snyder.
World Oil, Vol 172, No 1, p 72-73, January 1971. 2 fig.

Descriptors: *Wells, Oil wells, Oil industry, Aquifer characteristics, *Flow characteristics, Hydraulics.
Identifiers: *Well development, Epoxy injection, *Controlled pressure surge.

Shell Oil Co. has improved productivity on well completions and increased workover success with new tools and methods which are designed to give a controlled pressure surge into the well from the formation to remove perforation restrictions and plugging. The basic goal is to provide the cleanest possible avenue between the well bore and the formation to enlarge the effective wellbore for maximum natural flow, clean all perforations to more effectively inject sand consolidation chemicals or efficiently distribute gravel packing material, open all perforations to acid stimulation, without fracture treatment, to expose entire pay zone. The back surge methods and tools discussed have improved consolidation jobs by assuring open perforations, and thereby reducing epoxy injection pressures, and allowing proper mechanical gravel packing. (Campbell-NWWA)
W73-12773

WASTE DISPOSAL WELL PERFORMANCE,
Monsanto Biodize Systems, Inc., Great Neck, N.Y.
For primary bibliographic entry see Field 05E.
W73-12779

THE DESIGN AND OPERATION OF DEEP--WELL DISPOSAL SYSTEM,
Chemstrand Corp., Pensacola, Fla. Utilities Assistance Group.
For primary bibliographic entry see Field 05E.
W73-12780

THE DISPOSAL OF WASTEWATER UNDERGROUND,
For primary bibliographic entry see Field 05E.
W73-12781

CHANNEL EROSION SURVEYS ALONG PROPOSED TAPS ROUTE, ALASKA, JULY 1971,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 02J.
W73-12957

8C. Hydraulic Machinery

THE MULTIPURPOSE DEVELOPMENT OF THE RIVER RHONE VALLEY,
Compagnie Nationale du Rhone, Lyon (France).
For primary bibliographic entry see Field 04A.
W73-12467

AN ELECTRIC CONVERSION FOR MECHANICAL HYDRAULIC GOVERNORS OF WATER WHEEL TURBINES,
Bureau of Reclamation, Denver, Colo.
C. L. Clemans.
Rep REC-ERC-72-29, Sept 1972. 27 p, 19 fig, 3 ref, append.

Descriptors: *Governors, Mechanical equipment, Performance, Control, Velocity, Research and development, *Hydraulic turbines, Coordination, *Electronic equipment, Power system operations, Testing procedures, On-site tests.
Identifiers: *Synchronous machines, Power system stability, Interconnected systems, Sensitivity, Control equipment, Circuits.

A conversion system for upgrading performance of conventional mechanical governors for hydraulic turbines has been developed. The conversion retains the proven long-term stability of the ball head speed reference but replaces the dashpot function with derivative terms from an independent frequency sensor. The result upgrades the governor system from temporary droop type to a higher order derivative-proportional-integral type. Installation is simple. All original mechanical apparatus is retained for startup and standby; control can be transferred instantly. Advantages are higher sensitivity to small system speed deviations and faster, smoother response to system load control. (USBR)
W73-12469

LARGE HYDRAULIC GATES AND VALVES IN THE SNOWY MOUNTAIN SCHEME--A REVIEW OF PRACTICE,
Snowy Mountains Hydro-Electric Authority, Cooma (Austrailia).
A. N. G. Bray.
Inst Eng, Aust, Mech Chem Eng Trans, Vol MC8, No 1, p 37-43 May 1972. 7 fig, 1 ref, disc.

Descriptors: *Hydraulic gates, *Hydraulic valves, Hydraulic machinery, Hydraulic design, Automatic control, Gate hoists, Evaluation, Construction materials, Performance, Installation, Spillway gates, Radial gates, Butterfy valves, Stainless steel, Operation and maintenance, Reviews, *Hoisting machinery, *Australia.
Identifiers: Snowy Mountains Scheme (Australia), Policies, Foreign construction.

Hydraulic gates and valves constitute the basic control elements and are a prominent feature of the Snowy Mountain Scheme, which has been put into operation over the past 20 yrs. The general policies are reviewed and the effectiveness of the philosophies used are assessed. Gates and valves used in the main hydraulic systems of the scheme are listed. Trends in application of spillway gates, butterfly valves, gate hoists, and automatic gates are discussed. Records of serious malfunctions that have occurred, observations on significant developments in materials and on general trends during construction of the scheme are given. The successful construction and operation of the scheme suggests that sound practives have been used, and the experience gained has received recognition in Australia and other countries. (USBR)
W73-12476

ENERGY METHOD FOR COMPUTING THE AMPLITUDE OF VIBRATION OF CONDUCTOR BUNDLES DUE TO WAKE EFFECT,
Politecnico di Milano (Italy). Istituto di Meccanica Applicata.
G. Diana, and M. Gasparetto.
Eneg Elettr, Vol 49, No 8, p 532-539, Aug 1972. 10 fig, 7 ref.

Descriptors: *Transmission lines, Wind velocity, *Bundled conductors, Frequency, *Energy, Analytical techniques, Foreign research, Computer programs, Flow around objects.
Identifiers: Aerodynamic forces, Italy, *Vibration (Aeolian), *Wind (Meteorology), Amplitude, Electric conductors, Wakes, Galloping conductors, Harmonies, Motion, Computation, Mathematical analysis.

The phenomenon responsible for large amplitude vibrations in bundled conductors of transmission lines is described. A method is developed for computing energy introduced by the wind when a cylinder is moving in a wake of another cylinder. From previous studies, a deduction was made that the phenomenon is characterized by an elliptical motion of the cylinder in the wake, though a mathematical model to explain this type of motion is difficult to determine. Starting with this elliptical motion concept, aerodynamic forces acting on the cylinder were computed. Knowing the energy introduced by the wind, the amplitudes of vibrations caused by the wake effect in bundled conductors can be computed. Results indicate: (1) the energy is primarily introduced by a drag variation and the lift has a negligible effect; and (2) the energy introduced in a cylinder vibrating in a wake of another cylinder is perceptible only at very low frequencies, this justifying low frequency vibration occurring in a bundled conductor system. (USBR)
W73-12480

GUIDE FOR THE DESIGN OF ALUMINUM TRANSMISSION TOWERS.
American Society of Civil Engineers, New York. Task Committee on Lightweight Alloys.

J Struct Div, Am Soc Civ Eng, Vol 98, No ST12, p 2785-2801, Dec 1972. 2 fig, 2 tab, 11 ref, 3 append.

Descriptors: Structural engineering, Loads (Forces), Aluminum alloys, *Transmission towers, Aluminum, Towers, *Structural design, Stress, Buckling, Shear, Mechanical properties, Design criteria, Structural members, On-site tests.
Identifiers: *Aluminum towers, Fasteners, Torsion, Ultimate loads, Bolted joints, Fabrication, Bolts.

The ASCE Task Committee on Lightweight Alloys has prepared a guide for designing transmission towers for all voltage levels, constructed from aluminum alloy 6061-T6. Loading or overload factors, clearances or other electrical requirements, suitability of tower configuration or type, guys, footings, or anchors, are not discussed, as these are considered to be outside the scope of this guide. Analysis of the tower, subjected to the desired combination of ultimate loads, for the forces and, moments in the parts of the tower, is presupposed and suitable sizes of members and fasteners to carry these ultimate loads are established. Fabrication is discussed sufficiently to ensure realization of the designer's intentions. Test methods are discussed only to ensure validity of the tests. All designs are subject to the final scrutiny of full-scale tower tests. The guide should be considered as a means of designing a tower that will sustain specified ultimate loads without significant permanent deformation. (USBR)
W73-12485

TURBINE DESIGN AND PERFORMANCE FOR THE MERSEY-FORTH HYDRO POWER DEVELOPMENT,
Hydro-Electric Commission, Tasmania.
G. J. Causo .
Inst Eng, Aust, Mech Chem Eng Trans, Vol MC8, No 1, p 31-36, May 1972. 11 fig, 2 tab, 9 ref.

Descriptors: *Hydraulic turbines, Draft tubes, Hydraulic machinery, Francis turbines, Pelton turbines, Prototype tests, Foreign projects, Water hammer, *Guarantees, Governors, Prototype tests, *Australia, *Model studies.
Identifiers: Tasmania (Australia), Turbine efficiency, Load rejection, *Performance tests, Spiral cases, Kapla turbines, Water column separation, Acceptance tests.

The Mersey-Forth Hydroelectric development in Northern Tasmania comprises 7 single unit power stations, with a total installed capacity of 308 mw. Four aspects of turbine design and performance discussed are: (1) use of models as the basis for performance guarantees and the allied control of prototype similarity; (2) elimination of conventional governor on a turbine with long tunnel and penstock system; (3) use of a spiral case having unusually small dimensions for a Kaplan turbine and resulting advantages; (4) use of air to avoid adverse effects from water column separation on a turbine with a long pressure tailrace. Model and prototype tests are presented. Regardless of turbine manufacture, all power stations are equipped with ASEA/KMW electrohydraulic governors, simplifying maintenance and permitting adaptation of centralized control. (USBR)
W73-12486

VERTICAL DYNAMIC RESPONSE OF EMBEDED FOOTINGS,
Bureau of Reclamation, Denver Colo.
D. A. Tiedemann.
Report REC-ERC-72-34, Sep 1972. 22 p, 20 fig, 3 tab, 26 ref.

Descriptors: *Seismic Studies, Foundation investigations, Soil investigations, *Seismic properties, *Soil dynamics, Resonance, Soil physical properties, Foundations, Towers, Bibliographies.
Identifiers: Resonant column test, Pacific Northwest-Southwest Intertie, Fort Thompson-Grand Isld Trans Line, Anchored footings, In situ test, Auger-type footings, Vibrators (Mechanical), Pressed plate footings, Dynamic tests, Belled footings, Natural frequency, Footings, Damping.

Field tests were conducted with vibrators on prototype embeded transmission tower footings in 2 different soils to determine their vertical mode dynamic response characteristics. One test was on a belled-auger footing in a soft, saturated clay. The remaining tests were on anchor bar, screw auger, and single- and double-pressed plate footings in low-density dune sand. Also, in situ wave velocity measurements and laboratory resonant column tests were conducted to determine dynamic properties of the soils. Response curves obtained for the belled-auger footing were compared with responses calculated using the half-space theory and the lumped parameter method. Results obtained using the half-space theory differed considerably from measured values. Lumped parameter results indicated that the method was applicable; however, additional testing is needed to further define the effects of embedment on the mass, spring, and damping constants. Dynamic properties of the dune sand determined by in situ velocity measurements, resonant column tests, and empirical relationships were in very close agreement. (USBR)
W73-12487

8D. Soil Mechanics

BUFFALO CREEK DAM DISASTER: WHY IT HAPPENED,
Geological Survey, Arlington, Va.
For primary bibliographic entry see Field 04C.
W73-12411

SIMPLIFIED CALCULATION OF EMBANKMENT DEFORMATIONS,
Sydney Univ. (Australia).
H. G. Poulos, J. R. Booker, and G. J. Ring.
Soil Found, Vol 12, No 4, p 1-17, Dec 1972. 18 fig, 1 tab, 5 ref, append.

Descriptors: *Settlement (Structural), *Elastic deformation, Graphical analysis, Structural behavior, *Embankment, *Earth dams, Deformation, Elastic theory, *Rockfill dams, Stress analysis, Consolidation, Soil pressure, Soil mechanics, Dam construction.
Identifiers: *Vertical displacements, *Horizontal displacements, Foreign studies, Horizontal movement, Calculations, Displacements, Finite element method.

A simple method is described for obtaining the observed displacements in an embankment or earth dam during the following incremental construction. The method calculations horizontal and vertical displacements and stresses by obtaining coefficients from graphs and using these coefficients in equations. Knowledge of the deformation performance of embankments is important in determining whether future performance will be satisfactory. Several solutions are presented for the displacements and stresses within a homogeneous embankment resting on a rough rigid base, and application of these solutions to practical problems involving nonhomogeneous embankments and consolidation movements is discussed. For a rockfill embankment, comparisons of predicted settlements, observed values, and values predicted from a finite element analysis suggest that the proposed simple method is useful for obtaining rapid estimates of embankment deformations. (USBR)
W73-12473

TIME EFFECTS ON DYNAMIC SHEAR MODULUS OF CLAYS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 02G.
W73-12477

BEARING CAPACITY OF FOOTINGS IN PLANE STRAIN,
Colorado Univ., Boulder.
H-Y, Ko, and L. W. Davidson.
J Soil Mech Found Div, Am Soc Civ Eng, Vol 99, No SM1, p 1-23, Jan 1973. 10 fig, 4 tab, 28 ref, 2 append.

Descriptors: *Foundation bearing tests, Laboratory tests, Foundation failure, Soil mechanics, Theoretical analysis, Bearing strength, Foundations, Bibliographies.
Identifiers: *Continuous footings, Plane strain, Foundation models, *Bearing capacity, *Footings, Sands, Roughness, Smoothness, Bearing pressure, Internal friction, Ultimate loads, Test results, Comparative studies, Loading tests.

An experimental program to study plane strain bearing capacities of model strip footings on dense sand is described. The model footings tested (1) were either 3 by 4 in. or 6 by 4 in. in plan (test box was 4 in. wide) and (2) had a smooth (glass) or rough (sandpaper) base. Test results showed plane strain conditions must be maintained in the test box, as deflections of the walls can cause a significant reduction in the ultimate bearing capacity and can allow lodging of sand grains between the footing and walls. Results also show that ultimate bearing capacities for rough footings are only 10% higher than those for smooth footings; thus, Meyerhof's recommendation that 1/2 (N sub gamma) be used for smooth footings is not substantiated. Sokolvski's method of solving the plasticity problem, as illustrated through the scaling procedure developed by Ko and Scott, produces the most accurate estimate of smooth footing bearing values and appears to give a slightly conservative estimate of rough footing bearing values. Use of internal friction angles calculated from triaxial tests as compared to plane strain tests is also discussed. (USBR)
W73-12484

VERTICAL DYNAMIC RESPONSE OF EMBEDED FOOTINGS,
Bureau of Reclamation, Denver Colo.
For primary bibliographic entry see Field 08C.
W73-12487

8E. Rock Mechanics and Geology

EVALUATION OF HYDRAULIC PROPERTIES OF ROCK MASSES INFLUENCED BY MAJOR HETEROGENEITIES,
Golder, Brawner and Associates Ltd., Vancouver (British Columbia).
J. C. Sharp, Y. N. T. Maini, and T. L. Krekke.
Paper, 14th Symp Rock Mech, Penn State Univ, University Park, June 1972. 21 p, 9 fig, 10 ref.

Descriptors: *Heterogeneity, *Tunnel construction, *Faults (Geologic), Engineering geology, Groundwater movement, *Variability, *Hydraulic properties, Foundation investigations, Hydraulic conductivity, Tunnels, Seepage, Tunneling, Excavation, Slope stability, Piezometers, Rock mechanics, Base flow, Hydrogeology.
Identifiers: Hydraulic pressure tests, *Rock slope stability, In situ tests, Permeability tests.

Natural geologic processes generally cause heterogeneities (faults, sedimentary layers, and solution channels) in rock masses that can have a major influence on ground-water flow if the heterogeneities are continuous. Heterogeneities can be either permeable (water carrier) or impermeable (water barrier) relative to the rock mass and can be helpful or hazardous relative to slope stability, foundation, and tunneling situations. For slope stability under drawdown conditions, an impermeable clay seam running parallel to the slope can prevent ground-water pressures from dissipating, and lead to failure. In excavations and tunnels, permeable faults can allow costly water inflows, whereas, water trapped behind an impermeable fault or seam can burst suddenly into an excavation. In predicting the influence of heterogeneities, their areal extent and hydraulic conductivity relative to the surrounding rock are needed. A tunnel construction example is presented wherein an impermeable fault with a 250-ft head acting upon it was detected by piezometer measurements. A differential pressure test to evaluate expected flow across a fault is described. (USBR)
W73-12468

STRESS DISTRIBUTION AROUND A TUNNEL SITUATED IN A LAYER UNDER THE ACTION OF GRAVITY,
National Technical Univ., Athens (Greece).
P. S. Theocaris, and E. Koroneos.
Rock Mechanics, Vol 4, No 3, p 140-154, Nov 1972. 10 fig, 17 ref.

Descriptors: *Tunnels, *Tunnel pressures, Rock mechanics, Gravity, Stress, Stress analysis, *Tunnel design, Foreign research, Bibliographies, Elastic deformation, Strain, Laboratory tests, Model studies, Testing procedures.
Identifiers: Moire pattern, Greece, Experimental models, *Stress distribution, Displacement, Rock pressures, Test results, Underground openings.

A laboratory investigation determined the stress distribution around a circular tunnel caused by the forces of gravity. Tests were made on a model of a strongly plasticized epoxy polymer. Deformation of the 1- by 14- by 31-cm model was achieved by the inversion method, in which the model was freely suspended from the one extremity and left to deform by its own weight. The model simulated a circular tunnel surrounded by a narrow vertical layer loosely connected with neighboring layers. The projected image Moire method was used for measuring displacements. From the displacement, strains and stresses were calculated. Conclusions are that: (1) the stress field distrubance caused by the tunnel opening extends outward for 2 tunnel diameters; (2) maximum normal stresses appear at the springlines, invert, and crown of the tunnel; (3) tangential stress at the walls can increase to 3 times the value for the corresponding layer with no tunnel opening; (4) the tunnel has a strong influence on shear stresses; and (5) actual stress distribution around tunnels should be thoroughly examined. (USBR)
W73-12490

WAVE TRANSMISSION THROUGH ROCK STRUCTURES; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulic Lab.
For primary bibliographic entry see Field 08B.
W73-12563

GEOLOGY OF NELSON AND WALSH COUNTIES, NORTH DAKOTA,
Geological Survey, Grand Forks, N. Dak.
For primary bibliographic entry see Field 02F.
W73-12579

WELL LOGS CAN INDICATE FORMATION DRILLABILITY,
California Univ., Berkeley.
W. H. Somerton, and S. El-Hadidi.
World Oil, Vol 173, No 7, p 55-56, December 1971. 1 fig, 16 ref.

Descriptors: *Wells, *Well drilling, Borehole geophysics, Core logging, *Logging, Lithologic logs.
Identifiers: *Sonic transit time log, Sonic velocity, *Rock drillability.

Recent studies of well logs indicated that the resistance of rock to drilling can be determined from sonic transit times and a companion log that provides mineralogical information about the formation being penetrated. A relationship between penetration rate and lithology logs is conspicuous. Correlation between rate of penetration and logs showing variations in physical properties is impossible without accounting for drilling condition variations. Presented are two formulae for relating drilling strength to standard drilling variables so that a correlation between log data and drillability can be established. (Hunt-NWWA)
W73-12769

BACK-SURGE TECHNIQUE IMPROVES WELL COMPLETIONS,
For primary bibliographic entry see Field 08B.
W73-12773

8F. Concrete

TESTS OF SELECTED INSULATING MATERIALS FOR MASS CONCRETE,
Army Engineer, Waterways Experiment Station, Vicksburg, Miss.
E. C. Roshore, and H. T. Thornton, Jr.
Available from NTIS, Springfield, Va 22151 as AD-756 113 Price $3.00 printed copy; $1.45 microfiche. Technical Report C-70-4, September 1970. 19 p, 1 fig, 4 tab, 2 ref.

Descriptors: *Engineering structures, *Structural analysis, *Concrete testing, *Thermal expansion, *Thermal insulation, Laboratory tests, Temperature, Winds, Moisture, Weathering, Evaluation, Design criteria.

During the early ages of mass concrete construction, the interior of the concrete mass can be at temperatures well above freezing while the bulkhead and lift surfaces are being subjected to sub-

freezing temperatures. This condition can result in thermal cracking of the concrete in mass structures. Various types of materials were investigated for insulating mass concrete. The physical and thermal properties of the selected materials were determined under a variety of conditions in the laboratory. The overall heat-transfer characteristics of the materials were determined by using them to insulate standard 2-ft concrete cubes under different temperature, wind velocity, and moisture conditions in the laboratory. Thermal gradient data were developed using both insulated and uninsulated cubes. Outdoor weathering tests were conducted and the insulating properties of several of the materials was tested under field conditions on rough horizonatal and vertical surfaces. Only one of the materials tested is considered satisfactory for the long-term field insulation of mass concrete structures; four materials are considered satisfactory for short-term insulation (15 to 20 days) in the field; two of the materials are not considered satisfactory for either short- or long-term field use. The foamed-in-place insulating material adheres satisfactorily to both horizontal and vertical concrete surfaces under both wet and dry conditions and can be removed without great difficulty. However, this type of material has a pressure buildup in vertical forms caused by self-restriction of upward movement of the foam. (Woodard-USGS)
W73-12431

LEACHING OF CEMENT FROM A CONCRETE PILE SECTION BY GROUNDWATER FLOW,
Cementation Co. Ltd., London (England).
I. W. Farmer.
Civil Engineering and Public Works Review, Vol 64, No 745, p 457-458, May 1969. 4 fig, 2 tab, 3 ref.

Descriptors: Aquifer characteristics, Permeability, *Cement, Hydraulics, *Subsurface drainage, *Groundwater movement, Porosity.
Identifiers: *Critical erosion velocity, Velocity of seepage flow, *Pore space, Hydraulic gradients.

Inspection of cast in situ bored piles has revealed bands of concrete containing honeycombed areas which have been attributed to leaching of cement from the fresh concrete by ground water flow. Two types of groundwater flow are normally encountered in piling works in permeable ground: sub-horizontal flow due to hydraulic gradients, and near vertical flow due to tidal movement in costal works. In the former case it is possible to visualize relatively high rates of flow with correspondingly high seepage velocities, which could induce surface leaching if velocities exceed 5 cm/sec. In the latter case, maximum seepage velocities are of a low magnitude (1 to 2 feet/hr) which is insufficient to cause leaching from a well graded, correctly placed, fluid state concrete. A laboratory experiment to determine degree of leaching at project site velocities is presented. (Smith-NWWA)
W73-12766

GALVANIC CORROSION OF METALS IN CEMENTING MATERIALS,
For primary bibliographic entry see Field 08G.
W73-12775

8G. Materials

TESTS OF SELECTED INSULATING MATERIALS FOR MASS CONCRETE,
Army Engineer, Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08F.
W73-12431

STRENGTH ANALYSIS OF CORNER COLUMN-SLAB CONNECTIONS,
Calgary Univ. (Alberta).
For primary bibliographic entry see Field 08A.
W73-12465

WELDING OF A NORMALIZED HIGH STRENGTH LOW ALLOY PLATE STEEL OF STRUCTURAL QUALITY,
United States Steel Corp., Monroeville, Pa. Applied Research Lab.
W. P. Benter, Jr.
Weld J, Vol 51, No 12, p 591-s-598-s, Dec 1972. 11 fig, 10 tab, 2 ref.

Descriptors: *Welding, *Welded joints, *Structural steel, *High strength steels, Evaluation, Tensile strength, Testing procedures.
Identifiers: Bend tests, Crack propagation, Weldments, Arc welding, Electroslag welding, *Butt joints, Notch tests, Tensile properties, *Low alloy steels, Impact tests, Hardness tests, Tension tests.

Normalized high-strength low-alloy steels are being used to provide structural quality plate steels with improved low-temperature notch toughness for welding applications. Welding characteristics of one such steel are discussed. The investigation covers evaluation of butt welds made by shielded metal-arc, submerged arc, tandem submerged arc, electrogas, and electroslag processes, and includes data on tension tests, guided bend tests, Charpy V-notch tests (base metal, weld metal, and heat-affected zone), and explosion-bulge tests. This steel can be satisfactorily welded with all these processes by using commercially available filler metals, fluxes, and gases, provided low-hydrogen practices are followed. All processes produce butt joints with 100% joint efficiency and satisfactory bend-test ductility. The notch toughness of the weld metal and heat-affected zone, as measured by Charpy V-notch tests and confirmed by explosion-bulge tests of shielded metal-arc, submerged arc, and tandem submerged arc weldments, is excellent. The higher heat input electrogas and electroslag welding processes showed a deterioration of Charpy V-notch properties in the heat-affected zone to the level that would be expected in hot rolled steels of this type. (USBR)
W73-12466

SIMPLIFIED CALCULATION OF EMBANKMENT DEFORMATIONS,
Sydney Univ. (Australia).
For primary bibliographic entry see Field 08D.
W73-12473

TIME EFFECTS ON DYNAMIC SHEAR MODULUS OF CLAYS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 02G.
W73-12477

BEARING CAPACITY OF FOOTINGS IN PLANE STRAIN,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 08D.
W73-12484

HIGH STRENGTH BOLTED GALVANIZED JOINTS,
Carleton Univ., Ottawa (Ontario).
D. J. L. Kennedy.
J Struct Div, Am Soc Civ Eng, Vol 98, No ST12, p 2723-2738, Dec 1972. 14 fig, 5 tab, 8 ref, append.

Descriptors: High strength steel, *Joints (Connections), Steel, *Structural steel, Mechanical properties, *Ductility, Foreign research, Failure (Mechanics), Corrosion control, *Steel structures, Protective coatings, Bolts.
Identifiers: *High strength bolts, Galvanized steel, *Bolted joints, Galvanizing, Test results, Stress concentration, Friction coefficient (Mechanical), Fatigue tests, Brittleness, Bolts.

High-strength bolts are the chief mechanical fasteners used for making field connections in steel construction. Behavior of hot dip galvanized high-strength bolted joints under repeated load is discussed. Tests on steel plates without apparent stress concentrations show that hot dip galvanizing reduces the fatigue strength about 4% in zero-to-tension cycles. Galvanizing, in the presence of a notch, in the form of a hole, reduces fatigue strengths by up to 28% at some stress levels in zero-to-tension cycles. Analysis indicates this reduction is caused by loss of ductility of galvanized steel plate compared with as-rolled black plate. Initial coefficients of friction for galvanized plates in these tests were about one half the values for plates with mill scale. Under reversed loading, galvanized joints locked after a few cycles of load, and slip ceased. Because of this action and the fact that fatigue failures of the connections occurred in front of the net section, the fatigue strength of galvanized friction-type connections was comparable to that of identical black connections in zero-to-tension and one-half compression-to-tension cycles. (USBR)
W73-12489

CORROSION BY THE SULPHATE-REDUCING BACTERIA,
University of Manchester Inst. of Science and Technology (England). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05G.
W73-12756

COMPARISON OF WATERFLOOD CORROSION DETECTION AND MONITORING DEVICES,
Atlantic Richfield Co., Bakersfield, Calif.
R. L. Alvis.
Materials Protection, Vol 8, No 2, p 39-42, February 1969. 4 fig, 2 tab, 1 ref.

Descriptors: *Corrosion, *Oxidation, *Pitting, *Chemical reactions, Wells, Injection wells.
Identifiers: Oxygen scavengers, Membrane type oxygen sensor, Water flood, Corrosion coupons.

Most published information on various corrosion detection and monitoring devices has been derived from laboratory tests. A comparison is presented of 3 methods of corrosion detection and monitoring electrical resistance, polarization rate and coupon analysis used in a California water injection system. Also presented is a case study of the role of D.O. in corrosion and the relative effectiveness of 4 chemical scavengers in the control of D.O. in the system. No single device or technique is totally effective in corrosion detection or monitoring, therefore a combination program tailored to the system is required. (Campbell-NWWA)
W73-12757

SAND CONTROL - 3. CHEMICAL CONSOLIDATION,
Standard Oil Co. of California, San Francisco.
E. B. Rodgers, Jr.
Oil and Gas Journal, Vol 69, No 46, p 152-154, 156, 161, November 15, 1971. 3 fig, 1 tab.

Descriptors: *Aquifer characteristics, Permeability, Cement, *Grouting, Wells, Oil industry, *Hydraulic-fracturing, Hydrostatic pressure, Rock mechanics, Stress, *Chemical reactions.
Identifiers: Well stimulation, *Resin compounds, Organic compounds, *Formation-fracture pressures.

The newest approach to solving the sanding problem in well systems in consolidation, or cementation of the production formation by chemical means. This method began in the late 1940s. While some inorganic methods have been attempted, commercial processes today consist of injecting liquid organic substances (more appropriately called resins than plastics) into the for-

mation where they harden (polymerize) by one of two processes, i.e. preactivation or in situ. Resin characteristics, process classification, process characteristics, factors affecting results and application methods are discussed. Critical to the success of this method is the selection of the resin, and control of the injection pressures to assure proper particle bonding and uniform consolidation for it takes only one unconsolidated preforation to cause a process failure. (Smith-NWWA)
W73-12760

HERE'S A NEW SAND PACK METHOD,
Halliburton Services, Tulsa, Okla.
B. M. Young, J. G. Cook, and A. L. Donaldson, Jr.
Oil and Gas Journal, Vol 67, No 10, p 64-67, March 10, 1969. 3 fig, 2 tab, 7 ref.

Descriptors: *Oil wells, Cement, Grouting, Oil industry, *Chemical reactions, Permeability, Aquifer characteristics, Louisiana.
Identifiers: Resin compounds, Offshore wells, Karpoff, *Well construction.

The resin-sand-pack method is designed to control sand in many of the more difficult cases; long and short intervals in multiple completions, old wells, and in some cases, newly completed zones. It is applicable to all formations that will accept a quantity of sand. In one of the newest developments a small quantity of furan consolidating resin is dispersed in a diesel oil carrying fluid just before or during sand proportioning, (Karpoff's formular for proper sand pack seizing is used). Unlimited placement time is achieved by injecting the oil-catalyst (strong organic acid) solution after final sand placement. Instant resin harding occurs upon contact, yielding short well shut-in times. Resin-sand-pack application has favorable cost effectiveness due to the overall speed of process completion, and no requirement for special down hole equipment. (Smith-NWWA)
W73-12761

MICELLAR SOLUTIONS STIMULATE WELLS,
Amoco Production Co., Tulsa, Okla.
For primary bibliographic entry see Field 08B.
W73-12762

CATHODIC PROTECTION FOR COATED STEEL PIPELINES,
Colorado Springs Dept. of Public Works, Colo. Water Div.
E. W. Bailey.
Journal of the American Water Works Association, Vol 63, No 2, p 85-88, February 1971. 3 fig.

Descriptors: *Pipelines, Engineering structures, *Metal pipes, Joints, Linings, *Cathodic protection, Equipment, *Corrosion, *Resistivity, *Colorado.
Identifiers: Dresser couplings, As-built drawings, Sacrificial anodes, Electrical bonding, Colorado Springs (Colo).

Cathodic protection of steel water pipelines, although widely practiced today was not a common practice fifteen years ago. Steel waterpipes installed fifteen or more years ago within the Colorado Springs water system were generally coal-tar coated and lined. A recurring leakage problem in a 75 mile, 30 inch, transmountain diversion pipeline addition to the city's water system, with its associated high repair cost (approx. $1000-2000 per leak), promoted the investigation and eventual installation of cathodic protection for the pipeline. The history and progressive steps of this project are detailed. (Campbell-NWWA)
W73-12765

CORROSION MONITORING METHOD REDUCES EFFECT OF VARIABLES IN ANALYZING OIL FIELD WATERS,
Texaco, Inc., Bellaire, Tex. Bellaire Research Labs.
A. C. Nestle.
Materials Protection, Vol 8, No 5, p 49-52, May 1969. 3 fig, 1 tab, 3 ref.

Descriptors: *Corrosion, Wells, Oil wells, On-site tests, Testing procedures, Analytical techniques, *Sampling, *Water analysis, Monitoring.
Identifiers: *Dissolved iron content, Visual comparators, Photoelectric comparators.

Corrosion control trend data can be obtained using an improved method for dissolved iron content testing which includes sampling, sample handling and analysis. Interpretation of trends usually shows either the degree of corrosion control success or the need for further and more specific monitoring. A practical method for analyzing water for dissolved iron is described. The method is based on modified conventional practices and appears to be unique in regard to the reproducibility of results that can be obtained. Procedures for sampling and field and laboratory testing are detailed. (Hunt-NWWA)
W73-12767

CORROSION OF METALS IN TROPICAL WATERS--STRUCTURAL FERROUS METALS,
Naval Research Lab., Washington, D.C.
C. R. Southwell, and A. L. Alexander.
Materials Protection, Vol 9, No 1, p 14-23, January 1970. 11 fig, 4 tab, 13 ref.

Descriptors: *Corrosion, Pitting, Wells, *Chemical reactions, Damages, *Metallurgy, *Saline water.
Identifiers: *Corrosion time curve, Stabilized corrosion rates, *Oxygen diffusion control.

Corrosion data are reported for 20 structural ferrous metals exposed over a varying time period to natural tropical seawaters and fresh waters - situations analogous to those encountered in fluid-zone penetrations experienced in ground water development. Time-corrosion curves derived from both weight loss and pitting are presented for many of the ferrous alloys and tabulated data for all metal environment combinations are included. These comprehensive long term results comprise the most extensive collection of accurate sea water and fresh water corrosion data presently available. After initial periods of changing slopes, corrosion rates for most of the ferrous metals stabilize to constant values. These steady state rates are presented for each exposure and provide a significant means for comparing the corrosion resistance of the different metals in the various environments and for estimating useful life over extended periods. Corrosion curves for eight low alloy steels, Aston process wrought iron, and various cast irons and steels are evaluated against C steel. Marine corrosion in the tropics is compared with available ferrous metal results from temperate latitudes. (Hunt-NWWA)
W73-12772

GALVANIC CORROSION OF METALS IN CEMENTING MATERIALS,
J. W. Pitts.
The Military Engineer, Vol 59, No 387, p 40-41, January-February 1967. 2 fig.

Descriptors: *Corrosion, Damage, *Chemical reactions, *Construction materials, Well casings.
Identifiers: *Galvanic action, Galvanic cell.

Galvanic corrosion of metals embedded in cementing materials is known to have caused failures of steel-reinforced concrete systems containing aluminum conduit and copper tubing. Studies of such failures have led to the understanding of the basic causes of the corrosion, and actions that can be taken to eliminate the problem. A discussion is presented of the cause-effect of this type of corrosion and precautions to be taken during construction to eliminate the problem. (Hunt-NWWA)
W73-12775

PITLESS UNITS AND ADAPTERS,
Environmental Protection Agency, Washington, D.C. Div. of Water Supply.
W. J. Whitsell.
Water Well Journal, Vol 26, No 8, p 34-37, August 1972. 1 fig.

Descriptors: Equipment, *Wells, *Water wells, *Corrosion, Well casing, Metallurgy, Metals, Materials.
Identifiers: Electrolytic corrosion, *Pitless adapters, Positive pressure conditions, Negative pressure conditions.

Because of the pollution hazards involved, many states prohibit the use of a pit house. A commercially available unit known as a pitless adapter eliminates the need for a well pit. A specially designed connection between the underground horizontal discharge pipe and the vertical casing pipe makes it possible to terminate the permanent watertight casing of the well at a safe height above final grade. The underground section of the discharge pipe is permanently installed eliminating the need for attention during maintenance operations. A discussion is presented of advantages and installation procedures for pitless adapters. (Hunt-NWWA)
W73-12776

GUIDE SPECIFICATION FOR CHEMICAL GROUTS.
American Society of Civil Engineers, New York. Committee on Grouting.

Journal of Soil Mechanics and Foundations Division, American Society of Civil Engineers, Vol 94, No SM2, p 345-352, March 1968.

Descriptors: *Chemical grouting, Wells, Groundwater, *Grouting.
Identifiers: Cementing specification, Aquifer protection, *Water well construction.

Specifications are provided for chemical grouts which are intended to make it possible for the project engineer to obtain the chemical or chemicals desired, and to effect grouting operations intended with these materials. For the purpose of these specifications, grouts are considered to be any material which may be pumped or placed into voids in a formation to change the formation properties. Chemical grouts are defined as true solutions, which contain no suspended particles unless those are deliberately added for some specific purpose. (Campbell-NWWA)
W73-12782

FUNGI COLONIZING WOOD SUBMERGED IN THE MEDWAY ESTUARY,
Aberdeen Univ. (Scotland). School of Agriculture.
For primary bibliographic entry see Field 02L.
W73-12825

8I. Fisheries Engineering

INVESTIGATIONS ON AMERICAN SHAD IN THE ST. JOHNS RIVER,
For primary bibliographic entry see Field 02H.
W73-12370

PRELIMINARY STUDY OF SABLEFISH CULTURE, A POTENTIAL NEW INDUSTRY,
Fisheries Research Board of Canada, Nanaimo (British Columbia). Biological Station.

W. A. Kennedy.
J Fish Res Board Can. Vol 29, No 2, p 207-210. 1972. Illus.
Identifiers: Anoplopoma-Fimbria, *Fish industry, *Sablefish culture, Fish rearing.

A new industry may be possible based on capture of 2nd-year juvenile sablefish (Anoplopoma fimbria) weighing about 300 g then rearing them to 4 kg for sale. Sablefish were easy to rear. Under growth-favoring conditions they gained about 150 g/fish/mo., used about 5 kg wet weight of feed/kg gained, and had mortalities of less than 1%/mo. Concentrations of at least 43 kg of fish/m2 or 70 g/l did not adversely affect growth or mortality.--Copyright 1972, Biological Abstracts, Inc.
W73-12373

A PILOT FISH-POND SYSTEM FOR UTILIZATION OF SEWAGE EFFLUENTS, HUMBOLDT BAY, NORTHERN CALIFORNIA,
California State Univ., Humboldt, Arcata.
For primary bibliographic entry see Field 05D.
W73-12434

REARING CHANNEL CATFISH FINGERLINGS UNDER INTENSIVE CULTURE CONDITIONS,
Skidway Inst. of Oceanography, Savannah, Ga.
R. R. Stickney, T. Murai, and G. O. Gibbons.
Prog Fish-Cult. Vol 34, No 2, p 100-102, 1972. Illus.
Identifiers: *Ictalurus-Punctatus, *Rearing (fish), Tank cultures (Fish), *Channel catfish, *Catfish (Fingerlings).

Data obtained from rearing channel catfish (Ictalurus punctatus) fingerlings at three stocking densities under intensive tank culture conditions indicated that a stocking density which will yield approximately 1 lb/cf when the fish reach an average weight of 1/2 oz is desirable. A higher density (1.5 lb/cf (ft3)) resulted in considerably reduced growth rates, whereas growth rates at a lower density (0.5 lb/cf) were not substantially more rapid than that of fish reared to l lb/cf, until the desired maximum densities were approached.--Copyright 1972, Biological Abstracts, Inc.
W73-12488

THE AFRICAN GREAT LAKES FISHERIES: PAST, PRESENT AND FUTURE,
Food and Agriculture Organization of the United Nations, Jinja (Uganda). Lake Victoria Fisheries Research Project.
P. B. N. Jackson.
Afr J Trop Hydrobiol Fish. Vol 1, No 1, p 35-49. 1971.
Identifiers: *Africa, Alestes-imberi, Alestes-lateralis, Bagrus, *Fisheries, Great, Haplochromis, Lakes, Lates-niloticus, Management, Tilapia.

Earliest African fisheries were by waterside peoples using locally fabricated materials. Seine nets of woven twine, of Arabian origin, were later introduced. Gill-nets were introduced in 1905 and remain the most widely used gear. Tilapia species, all inhabiting inshore waters, remain the most important fish caught, but catches generally continue to decline. Further basic studies on Tilapia are necessary to improve management. Large boats with power-operated gear are an important recent innovation which may supplant canoes and gill-nets as producers of the main catch in large lakes, but for success require careful economic planning due to the high initial cost of vessels and essential shore installations. There are numerous management problems e.g. Labeo being heavily fished on spawning migrations, the capture of juvenile Bagrus while fishing for Haplochromis, or of Lates while fishing for clupeoids. Lates niloticus introduced to Lake Victoria have not succeeded so quickly as in Lake Kyoga, due probably to the young competing for food with Haplochromis species. The newcomer Alestes lateralis has supplanted A. imberi in Lake Kariba, through having a more extended spawning season.--Copyright, 1973, Biological Abstracts, Inc.
W73-12646

USE OF COLD BRANDS ON CHANNEL CATFISH,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
J. L. Brauhn, and J. W. Hogan.
Prog Fish-Cult, Vol 34, No 2, p 112, 1972.
Identifiers: *Channel catfish, Ictalurus-punctatus, Catfish, Cold brands, *Marking (Fish branding).

Liquid N was used to cool silver-tipped branding tools for marking individual adult channel catfish (Ictalurus Punctatus). Mark retention was excellent for 60 days. Legibility decreased thereafter until some types of numerals could not be identified at 120 days after branding. The technique is most useful for short-term research, but simple marks could be applied for population studies up to 365 days in length.--Copyright 1972, Biological Abstracts, Inc.
W73-12778

CONVERSION, MAINTENANCE AND ASSIMILATION FOR WALLEYE, STIZOSTEDION VITREUM VITREUM, AS AFFECTED BY SIZE, DIET AND TEMPERATURE
Ministry of Natural Resources, Port Dover (Ontario).
J. R. M. Kelso.
J Fish Res Board Can. Vol 29, No 8, p 1181-1192. 1972. Illus.
Identifiers: Amphipods, Assimilation, Conversion, Crayfish, Diet, Maintenance, Size, Stizostedion-Vitreum-Vitreum, Temperature, *Walleye, *Fish management.

An optimum ration was not readily apparent as conversion differed only slightly at high and low rations. Gross (K1) and net (K2) conversion was affected by neither ration size nor temperature, but decreased with increasing fish size. Conversion of the 3rd order (K3) was affected only by temperature, being greater at higher temperatures. Gross and net conversion were consistently lower at cycled temperatures, 16-8C. Gross and net conversion were similar since the high assimilation efficiency (82.1-97.9%) of S. vitreum vitreum did not greatly alter the latter. Assimilation efficiency was dependent upon diet type, least for invertebrates (82.1% for amphipods and 83.5% for crayfish) and greatest for fish (96.9% for age O perch and 97.9% for emerald shiners). Assimilation efficiency decreased with increasing walleye size (slope of -0.0045) irrespective of the food organism. Regurgitation of crayfish occurred in 2 of 3 trials, and it was not established if this was a natural phenomenon. Maintenance requirement per gram was independent of fish size, but was affected by temperature. Maintenance between temperatures of 4-12C was similar, 33.3-45.7 cal/g walleye/wk, but increased greatly above 12C. Results from maintenance experiments paralleled Winberg's (1969) approximation of routine metabolism.--Copyright 1973, Biological Abstracts, Inc.
W73-12832

PREDATION BY RAINBOW TROUT (SALMO GAIRDNERI): THE INFLUENCE OF HUNGAR, PREY DENSITY AND PREY SIZE,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
D. M. Ware.
J Fish Res Board Can. Vol 29, No 8, p 1193-1201. 1972. Illus.
Identifiers: Density, Hunger, *Predation, Prey, *Rainbow trout, Salmo-Gairdneri, Size, Trout.

The feeding behavior of rainbow trout (S. gairdneri) was investigated by exposing fish to several densities and sizes of prey over a range of 4 substrates of varying complexity. Within substrate treatments the rate of predation could be stimulated by increasing either prey density, prey size, or predator hunger. Between treatments, however, both the intensity of predation and total food consumption proved to be inversely related to the complexity of the substrate because a number of prey were able to find cover and thus escape detection. The results further indicate that the nature of foraging behavior may be controlled by a critical rate of food capture. If trout did not exceed an average of .058 captures sec-1, substrate-oriented search proceeded to wane.--Copyright 1973, Biological Abstracts, Inc.
W73-12836

DESIGN OF TRAPNET WITH INTERCHANGEABLE PARTS FOR THE CAPTURE OF LARGE AND SMALL FISHES FROM VARYING DEPTHS,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
R. J. Beamish.
Journal of the Fisheries Research Board of Canada, Vol 30, No 4, p 587-590, April 1973. 2 fig, 1 tab, 2 ref.

Descriptors: *Fishing gear, *Freshwater fish, *Marine fish, *Design, *Fabrication, Depth, Brook trout, Rainbow trout, Walleye, Yellow perch.
Identifiers: *Convertible trapnets, *Trapnets, Wolf Lake, White sucker, Common shiner, Redbreast sunfish, Brown bullhead, Southern redbelly dace, Cutlips minnow, Creek chub, Blacknose dace, Slimy sculpin, Lake whitefish, Arctic char, Smallmouth bass, Northern pike, Salvelinus alpinus, Coregonus clupeaformis, Salmo gairdneri, Micropterus dolomieui, Esox lucius, Stizostedion vitreum vitreum, Perca flavescens.

A new design is described for a convertible trapnet that is effective in catching small and large fishes in depths ranging from 3 to 15 ft (1-5 m). The nets are constructed from 1/32-inch (0.8-mm) square mesh, green mosquito-type nylon netting. Details of construction are included. Three designs have been successfully tested: (1) a basic 3-ft design, weight 31 lb; (2) a 9-ft net, weight 48 lb, that converts to the basic 3-ft design, and (3) a 6-ft net, weight 35 lb, that is similiar to the 9-ft model but reduced in proportions and not convertible. These three designs when fished in Wolf Lake (New York) captured nine of the ten species reported to be present. Trapnets of similar design have captured many other species of small and large freshwater fishes including arctic char, lake whitefish, rainbow trout, walleye, and yellow perch. They have also fished successfully in some marine habitats. (Holoman-Battelle)
W73-12899

THE GROWTH, REPRODUCTION AND FOOD OF THE ROACH RUTILUS RUTILUS (L.), OF THE RIVER LUGG, HEREFORDSHIRE,
Freshwater Biological Association, Wareham (England). River Lab.
J. M. Hellawell.
J Fish Biol. Vol 4, No 4, p 469-486, 1972, Illus.
Identifiers: *England, Growth, Herefordshire, Insect, Lugg, Molusks, Reproduction, River, *Roach, Rutilus-Rutilus, Vegetation, *River Lugg.

Checks were formed on the scales in June and July. A dominant 1959 year class accounted for half the population present in 1964. Females grew faster than males and attained greater ultimate size. Growth in the River Lugg was good in comparison with rates in other British waters. The sex ratio was found to change with age; a predominance of males in the youngest age classes changed to a preponderance of females in the older classes. The youngest fishes caught (3+) were already sexually mature. The gonads were a constant proportion of the body weight for fishes

of all sizes at a given season. Spawning was completed by June; males were ripe in May. The ovaries recovered more rapidly than the testes after spawning. Seasonal variation in feeding activity, with higher activity in summer, was observed and could be correlated with temperature. Seasonal changes in the diet could be related to availability. The diet was predominantly vegetable; the most important animal component, aquatic insect larvae, accounted for 11% of the total diet. Aerial insects were rarely eaten. Diet varied with age: molluscs being particularly important to older roach; younger roach consumed large amounts of substrate material. There is some evidence that young roach indiscriminately ingest substrate material but older roach are more selective and reject inert material.–Copyright 1973, Biological Abstracts, Inc.
W73-12921

PRIMARY PRODUCTIVITY IN A NEW AND AN OLDER CALIFORNIA RESERVOIR,
California State Dept. of Fish and Game, Sacramento.
L. L. Chamberlain.
Calif Fish Game. Vol 58, No 4, p 254-267, 1972.
Identifiers: *California, Carbon-14, *Fish populations, Fishery management, *Primary productivity, Reservoirs.

The sport fishery in new reservoirs often reaches a peak and then undergoes a marked decline a few years following impoundment. One theory attributes such declines to diminishing basic fertility. To test this theory, primary productivity in a new reservoir was measured by the C14 method for 4 yr. An older reservoir served as a control. High initial rates of C fixation in the new reservoir, attributed to flooding of organic material, were transitory. Subsequent patterns of primary productivity were similar in the 2 waters. Increases in primary productivity in both reservoirs were associated with establishment of planktivorous fish populations and demonstrated that declining primary productivity is not as inevitable result of initial reservoir aging.–Copyright 1973, Biological Abstracts, Inc.
W73-12998

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

ENCOURAGE APPLIED RESEARCH AND PUBLISH THE FINDINGS,
Minnesota Mining and Mfg. Co., St. Paul.
For primary bibliographic entry see Field 05G.
W73-12758

10C. Secondary Publication And Distribution

GROUND WATER POLLUTION IN THE SOUTH CENTRAL STATES,
Robert S. Kerr Environmental Research Lab., Ada, Okla. National Ground Water Research Program.
For primary bibliographic entry see Field 05B.
W73-12515

HORTON'S 1945 STUDY: A CARTOBIBLIOGRAPHY,
Indiana Univ., Bloomington. Dept. of Geography.
For primary bibliographic entry see Field 07C.
W73-12596

BIOLOGICAL EFFECTS OF ARTIFICIAL DESTRATIFICATION AND AERATION IN LAKES AND RESERVOIRS-ANALYSIS AND BIBLIOGRAPHY,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-12625

BIOLOGICAL EFFECTS OF OIL POLLUTION - SELECTED BIBLIOGRAPHY II,
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 05C.
W73-12626

BIOLOGICAL ASPECTS OF LEAD: AN ANNOTATED BIBLIOGRAPHY - LITERATURE FROM 1950 THROUGH 1964. PARTS I AND II,
Cincinnati Univ., Ohio. Coll. of Medicine.
For primary bibliographic entry see Field 05C.
W73-12627

ANNOTATED BIBLIOGRAPHY OF LAKE ONTARIO LIMNOLOGICAL AND RELATED STUDIES - VOL I - CHEMISTRY,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
For primary bibliographic entry see Field 02H.
W73-12753

ANNOTATED BIBLIOGRAPHY OF LAKE ONTARIO LIMNOLOGICAL AND RELATED STUDIES - VOL II - BIOLOGY,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
For primary bibliographic entry see Field 02H.
W73-12754

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State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
For primary bibliographic entry see Field 02H.
W73-12755

REPORTS FOR CALIFORNIA BY THE GEOLOGICAL SURVEY WATER RESOURCES DIVISION.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02A.
W73-12953

10F. Preparation of Reviews

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. I. GENERAL AND IN-PLANT MODIFICATIONS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12553

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. II. TESTING METHODS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05A.
W73-12554

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. III. STREAM RESPONSE,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05C.
W73-12555

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. A. PHYSICAL OPERATIONS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12556

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. B. BIOLOGICAL SYSTEMS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12557

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. C. CHEMICAL PROCESSES, GENERAL OBSERVATIONS, AND REPORTS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12558

ANNUAL LITERATURE REVIEW: ADMINISTRATION, SYSTEMS ANALYSIS,
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05G.
W73-12840

THE NITROGEN CYCLE IN SEDIMENT--WATER SYSTEMS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 05C.
W73-12843

PHYSIOLOGY AND CYTOLOGICAL CHEMISTRY OF BLUE-GREEN ALGAE,
MSU/AEC Plant Research Lab., East Lansing, Mich.
For primary bibliographic entry see Field 05C.
W73-12845

CARBON CYCLE IN SEDIMENT-WATER SYSTEMS,
National Environmental Research Center, Corvallis, Oreg.
For primary bibliographic entry see Field 05C.
W73-12846

TOTAL MERCURY ANALYSIS: REVIEW AND CRITIQUE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 05A.
W73-12885

PHOSPHATE CHEMISTRY IN LAKE SEDIMENTS,
Massey Univ., Palmerston North (New Zealand).
For primary bibliographic entry see Field 05C.
W73-12917

ANALYTICAL REVIEWS 1973/APPLICATIONS.
For primary bibliographic entry see Field 05A.
W73-12930

SUBJECT INDEX

ABSORPTION
Laser Induced Fluorescence in Algae: A New Technique for Remote Detection,
W73-12841 5A

Uptake of Mercury by Caged Rainbow Trout (Salmo Gairdneri) in the South Saskatchewan River,
W73-12857 5C

Trace Element Trapping in Pteropod Tests,
W73-12937 5B

ABSTRACTS
Biological Aspects of Lead: An Annotated Bibliography - Literature From 1950 through 1964. Parts I and II,
W73-12627 5C

ACETIC ACID
Recondition and Reuse of Organically Contaminated Waste Sodium Chloride Brines,
W73-12521 5D

ACID SOILS
Morphology, Genesis, Occurrence and Agricultural Potential of Acid Sulphate Soils in Central Thailand,
W73-12818 2G

ACTIVATED CARBON
Wastewater Treatment Design Related to Biological Growth Supported by Activated Carbon,
W73-12494 5D

Investigations on Waste Water Clarification with Activated Carbon (Untersuchungen zur Restabwasserklarung mit Aktivkohle),
W73-12543 5D

An Improved Method For Determining Organics by Activated Carbon Adsorption and Solvent Extraction - Pt. II (Test Method),
W73-12866 5A

ACTIVATED SLUDGE
Activated Sludge Plant,
W73-12451 5D

Selecting Waste Water Aeration Equipment,
W73-12534 5D

The TTC Test for the Control of Effluent Purification (Test TTC - Narzedziem kontroli procesu oczyszczania),
W73-12535 5D

Microbiological Treatment Parameters of Bleached Kraft Pulp Mill Effluents,
W73-12551 5D

Activated Sludge Treatment with Oxygen,
W73-12586 5D

ADAPTATION
Welwitschia Mirabilis: Paradox of the Namib Desert,
W73-12796 2I

ADAPTIVE CONTROL
Variable Sampling Frequency - A New Adaptive Technique,
W73-12616 7B

ADENOSINE TRIPHOSPHATE
ATP Pools in Pure and Mixed Cultures,
W73-12887 5A

ADMINISTRATION
Elements of the Water Resources Situation in Alabama,
W73-12749 6B

WPCF Project Report: A State Certification Program Guide,
W73-12842 5G

ADMINISTRATIVE COSTS
Notes on Information and Administrative Costs in the Theory of Externalities,
W73-12678 6B

ADRIATIC SEA
Thorium in Water and Algae from the Adriatic Sea,
W73-12927 5A

ADSORBENTS
The Effect of Adsorbents on the Rate of Degradation of Herbicides Incubated with Soil,
W73-12656 5B

ADSORPTION
Waste Water Purification by Breakpoint Chlorination and Carbon Adsorption,
W73-12459 5D

An Improved Method For Determining Organics by Activated Carbon Adsorption and Solvent Extraction - Pt. II (Test Method),
W73-12866 5A

Application of Liquid Chromatography to Pollution Abatement Studies of Munition Wastes,
W73-12877 5A

ADSORPTION (SOILS)
Water Vapor Adsorption by Water-Repellent Soils at Equilibrium,
W73-12968 2G

AERATED LAGOONS
Detoxification of Kraft Pulp Mill Effluent by an Aerated Lagoon,
W73-12529 5D

Selecting Waste Water Aeration Equipment,
W73-12534 5D

AERATION
Activated Sludge Plant,
W73-12451 5D

Flotation Machine with Vertically Reciprocating Aerators,
W73-12452 5D

Wastewater Treatment System,
W73-12455 5D

Waste Treatment System,
W73-12461 5D

Stabilization of Sewage Solids by the Channel Aeration Process,
W73-12502 5D

Selecting Waste Water Aeration Equipment,
W73-12534 5D

River Thames Antipollution: Boardmakers Install World's Largest Tidal River Surface Aerator.
W73-12548 5G

Aeration of the Thames.
W73-12549 5G

Large Surface Aerator Designed to Condition Board Mill Effluent.
W73-12550 5G

Artificial Reservoir Destratification Effects on Phytoplankton,
W73-12895 5C

Effects of Aeration, Water Supply, and Nitrogen Source on Growth and Development of Tupelo Gum and Bald Cypress,
W73-12923 2I

AERATORS
River Thames Antipollution: Boardmakers Install World's Largest Tidal River Surface Aerator.
W73-12548 5G

Aeration of the Thames.
W73-12549 5G

Large Surface Aerator Designed to Condition Board Mill Effluent.
W73-12550 5G

AERIAL PHOTOGRAPHY
Evaluation of ERTS Data for Certain Oceanographic Uses,
W73-12429 7B

Water Quality Determinations in the Virgin Islands from ERTS-A Data,
W73-12630 5A

AEROBIC BACTERIA
The Mechanisms of Nitrogen Assimilation in Pseudomonads,
W73-12881 5C

AEROBIC CONDITIONS
Degradation of Methylmercury by Bacteria Isolated from Environmental Samples,
W73-12620 5A

AEROBIC TREATMENT
Stabilization of Sewage Solids by the Channel Aeration Process,
W73-12502 5D

Tertiary Treatment of Combined Domestic and Industrial Wastes,
W73-12512 5D

Microbiology in the Aerobic Treatment of Farm Waste,
W73-12890 5D

AEROMONAS
Aeromonas-Induced Deaths Among Fish and Reptiles in an Eutrophic Inland Lake,
W73-12633 5C

AESTHETICS
Sixteenth Annual Arizona Watershed Symposium Proceedings.
W73-12403 4D

The Visual Aspects of Resource Management,
W73-12407 4D

Measuring Public Responses to Vegetative Management,
W73-12408 4D

AFRICA
The African Great Lakes Fisheries: Past, Present and Future,
W73-12646 8I

Classification of the Coastal Environments of the World: Part II. Africa,
W73-12950 2L

AGRICULTURE
Public Support of Private Water Resource Development in Agriculture--With Implications for Firm Growth,
W73-12698 4B

AGRICULTURE

Reuse of Human Wastes in Agriculture,
W73-12817 5D

AIR CIRCULATION
On The Number Distribution of Hail Growing in Updrafts,
W73-12602 2B

AIR GAPS
Effects of Air Gaps and Saturated Voids on Accuracy of Neutron Moisture Measurements,
W73-12636 2G

AIR POLLUTION
Transport of Heavy Metals Through the Air Environment,
W73-12609 5B

Analytical Reviews 1973/Applications.
W73-12930 5A

AIRCRAFT
Water Quality Determinations in the Virgin Islands from ERTS-A Data,
W73-12630 5A

ALABAMA
Elements of the Water Resources Situation in Alabama,
W73-12749 6B

ALABAMA (MOBILE BAY)
The Effect of Floodwater on Oysters in Mobile Bay,
W73-12658 5C

ALASKA
Glacial Environment and Processes in Southeastern Alaska,
W73-12423 2C

Chena River Lakes Project, Alaska, Problems Relating to Channel Development, Erosion, and Bank and Levee Protection,
W73-12559 8B

Navigation Channel Improvement, Gastineau Channel, Alaska; Hydraulic Model Investigation,
W73-12571 8A

Annual Water Balance and Agricultural Development in Alaska,
W73-12664 3F

Radiochemical Monitoring of Water After the Cannikin Event, Amchitka Island, Alaska, October, 1972,
W73-12945 5B

Channel Erosion Surveys Along Proposed Taps Route, Alaska, July 1971,
W73-12957 2J

ALDICARB
Edaphic and Water Relationships of Aldicarb and its Metabolites,
W73-12979 2G

ALGAE
Effects of Light and Temperature on Algal Growth,
W73-12396 5C

Algal Bioassays: Examples, Advantages, and Limitations of Current Approaches,
W73-12400 5C

AGP Studies in the San Francisco Bay-Delta,
W73-12401 5C

Black Phytokarst From Hell, Cayman Islands, British West Indies,
W73-12593 2J

Green Snow and Ice From the Antarctica,
W73-12644 2I

Effects of Fertilization on Aquatic Plants, Water and Bottom Sediments,
W73-12661 5C

Hydrostatic Pressure in Relation to the Synchronous Culture of Algae in Open and Closed Systems,
W73-12798 5C

Physiology and Cytological Chemistry of Blue-Green Algae,
W73-12845 5C

Sources of CO2 for Nuisance Blooms of Algae,
W73-13000 5C

ALGAL CONTROL
The Shagawa Lake Project: Lake Restoration by Nutrient Removal from Wastewater Effluent,
W73-12520 5D

ALGAL GROWTH
Physiology and Cytological Chemistry of Blue-Green Algae,
W73-12845 5C

ALGAL GROWTH POTENTIAL
AGP Studies in the San Francisco Bay-Delta,
W73-12401 5C

ALKALINE EARTH METALS
Determination of Exchangeable Cations in Calcareous Soils,
W73-12786 2G

ALKALINE SOILS
Sodium-Affected Soils in the Jordan Valley,
W73-12795 2G

ALKYLBENZENE SULFONATES
Determination of Alkylbenzenesulfonate (ABS) in Bottom Sediment,
W73-12932 5A

ALLUVIAL CHANNELS
River Channel Change With Time: An Example,
W73-12590 2J

ALLUVIUM
Presidio Bolson, Trans-Pecos Texas and Adjacent Mexico: Geology of a Desert Basin Aquifer System,
W73-12585 2F

An Approach to Hydrogeologic Investigations of River Alluvium by the Use of Computerized Data Processing Techniques,
W73-12942 2A

ALPINE
Snow Cover of the Issyk-kul' Depression and Its Alpine Environment (Snezhnyy pokrov Issyk-Kul'skoy kotloviny i yeye vysokogornogo obramleniya),
W73-12726 2C

ALUMINUM TOWERS
Guide for the Design of Aluminum Transmission Towers.
W73-12485 8C

AMCHITKA ISLAND (ALASKA)
Radiochemical Monitoring of Water After the Cannikin Event, Amchitka Island, Alaska, October, 1972,
W73-12945 5B

AMERICAN SHAD
Investigations on American Shad in the St. Johns River,
W73-12370 2H

AMMONIA
Spectrophotometric Determination of Ammonia,
W73-12886 5A

AMMONIA ELECTRODE
Determination of Ammonium in Soil Extracts and Water Samples by an Ammonia Electrode,
W73-12939 2G

AMMONIUM DETERMINATION
Determination of Ammonium in Soil Extracts and Water Samples by an Ammonia Electrode,
W73-12939 2G

AMPHIPODA
The Association of Amphipods in the Shallow-Water Sand Habitat of Strangford Lough, Co. Down,
W73-12879 5A

Description and Ecology of Hyaiella Texana N. Sp. (Crustacea: Amphipoda) from the Edwards Plateau of Texas,
W73-12900 2I

AMUR RIVER
Selection of a Suitable System of Effluent Purification (O vybore ratsional'noi sistemy ochistki stochnykh vod),
W73-12673 5D

ANAEROBIC CONDITIONS
Degradation of Methylmercury by Bacteria Isolated from Environmental Samples,
W73-12620 5A

ANAEROBIC TREATMENT
Identification and Control of Petrochemical Pollutants Inhibitory to Anaerobic Processes,
W73-12513 5D

ANALOG TO DIGITAL CONVERTERS
High Speed A-D Converters in a Memory Test System,
W73-12891 7C

ANALYTICAL TECHNIQUES
A Nitrogen Correction for Caloric Values,
W73-12383 5A

Stratigraphy of Fossil Pigments as a Guide to the Postglacial History of Kirchner Marsh, Minnesota,
W73-12386 5C

Algal Bioassays: Examples, Advantages, and Limitations of Current Approaches,
W73-12400 5C

The Evaluation of Existing Field Test Kits for Determining Free Chlorine Residuals in Aqueous Solutions,
W73-12426 5A

New Techniques for Participative Planning in Water Resources,
W73-12472 6B

Pitfalls and Procedures in BOD Tests,
W73-12527 5A

Water Pollution in the Pulp and Paper Industry. II. Testing Methods,
W73-12554 5A

Problems in the Analysis of Trace Metals,
W73-12608 5A

Biological Aspects of Lead: An Annotated Bibliography - Literature From 1950 through 1964. Parts I and II,
W73-12627 5C

Evaluation of Environmental Intangibles,
W73-12688 6B

Total Mercury Analysis: Review and Critique,
W73-12885 5A

Analytical Reviews 1973/Applications.
W73-12930 5A

ANIMAL BY-PRODUCTS
Factors Influencing Detection of Salmonellae in Rendered Animal By-Products,
W73-12619 5A

ANIMAL GROWTH
Annual Production of a Stream Mayfly Population: A Comparison of Methods,
W73-12905 5B

The Effects of Sublethal Concentrations of Whole Bleached Kraftmill Effluent on the Growth and Food Conversion Efficiency of Underyearling Sockeye Salmon (Oncorhynchus nerka),
W73-12913 5C

ANIMAL METABOLISM
The Effects of Sublethal Concentrations of Whole Bleached Kraftmill Effluent on the Growth and Food Conversion Efficiency of Underyearling Sockeye Salmon (Oncorhynchus nerka),
W73-12913 5C

ANIMAL METABOLISMS
Water Metabolism in Desert Sheep, Effects of Various Degrees of Water Restriction on the Distribution of Body Water in Mariwari Sheep,
W73-12788 3F

ANIMAL PATHOLOGY
Selenium in the Environment,
W73-12614 5C

ANIMAL PHYSIOLOGY
Water Metabolism in Desert Sheep, Effects of Various Degrees of Water Restriction on the Distribution of Body Water in Mariwari Sheep,
W73-12788 3F

Physiological Changes in Mytilus Edulis L. Induced by Temperature and Nutritive Stress,
W73-12878 5C

ANNELIDS
Some Effects of Evaporation Suppression on Reservoir Ecology,
W73-12869 5C

ANNUAL CYCLE
The Annual Cycle of Small Mammal Populations on a Zambian Floodplain,
W73-12814 2I

ANTARCTICA
Green Snow and Ice From the Antarctica,
W73-12644 2I

ANTITRANSPIRANT FILMS
Antitranspirant Film: Curtailing Intake of External Water by Cherry Fruit to Reduce Cracking,
W73-12992 2D

Relative Water Content of Leaves: Underestimation Caused by Antitranspirant Film,
W73-12994 2D

ANTITRANSPIRANTS
Antitranspirants for Conservation of Leaf Water Potential of Transplanted Citrus Trees,
W73-12993 2D

ANTOMATIC CONTROL
Variable Sampling Frequency - A New Adaptive Technique,
W73-12616 7B

APHIDS (YELLOW SUGARCANE)
Resistance in Digitaria to Yellow Sugarcane Aphid, Siphaflava (Forbes) as Related to Temperature and Rainfall,
W73-12643 2I

APPALACHIA
The Benthic Fauna in Four Small Southern Appalachian Streams,
W73-12784 2I

APPLIED RESEARCH
Biological Effects of Artificial Destratification and Aeration in Lakes and Reservoirs-Analysis and Bibliography,
W73-12625 5C

Encourage Applied Research and Publish the Findings,
W73-12758 5G

AQUACULTURE
Aqualculutre: The Farming and Husbandry of Freshwater and Marine Organisms,
W73-12830 3F

AQUATIC ALGAE
Some Effects of Evaporation Suppression on Reservoir Ecology,
W73-12869 5C

AQUATIC ANIMALS
A Cage for Exposing Aquatic Animals to Bottom Sediments,
W73-12372 2L

Biological Effects of Oil Pollution - Selected Bibliography II,
W73-12626 5C

AQUATIC BACTERIA
Degradation of Methylmercury by Bacteria Isolated from Environmental Samples,
W73-12620 5A

A Relationship between Heterotrophic Utilization of Organic Acids and Bacterial Populations in West Blue Lake, Manitoba,
W73-12903 5C

AQUATIC ENVIRONMENT
Carbon Cycle in Sediment-Water Systems,
W73-12846 5C

An Evaluation of Liquid Scintillation Counting Techniques for Use in Aquatic Primary Production Studies,
W73-12907 5A

AQUATIC INSECTS
Some Effects of Evaporation Suppression on Reservoir Ecology,
W73-12869 5C

AQUATIC LIFE
Water Pollution in the Pulp and Paper Industry. III. Stream Response,
W73-12555 5C

Biological Effects of Oil Pollution - Selected Bibliography II,
W73-12626 5C

AQUATIC MICROORGANISMS
Carbon Cycle in Sediment-Water Systems,
W73-12846 5C

AQUATIC POPULATIONS
Energetics of Natural Populations of Freshwater Macroconsumers,
W73-12374 5C

AQUATIC PRODUCTIVITY
Stratigraphy of Fossil Pigments as a Guide to the Postglacial History of Kirchner Marsh, Minnesota,
W73-12386 5C

The Nitrogen Cycle in Sediment-Water Systems,
W73-12843 5C

AQUATIC WEED CONTROL
Evaluation of Herbicides for Submerged Weeds in Chambal and Bhakra-Nangal Canal Systems,
W73-12738 5G

AQUEOUS SOLUTIONS
Aromatic Hydroxylation as an Analytical Reaction,
W73-12853 5A

Voltammetric Study of the Hydrogen Ion/Hydrogen Couple in Acetonitrile/Water Mixtures,
W73-12872 2K

Sodium Tungsten Bronze as a Potentiometric Indicating Electrode for Dissolved Oxygen in Aqueous solution,
W73-12873 5A

AQUIFER CHARACTERISTICS
Selected Data on Wells in the Barstow Area, Mojave River Basin, California,
W73-12421 4B

Geohydrology of the Dover Area, Delaware,
W73-12425 7C

Evaluation of the Water Resources of Lemmon Valley, Washoe County, Nevada, With Emphasis on Effects of Ground-Water Development to 1971,
W73-12718 4B

Sand Control - 3. Chemical Consolidation,
W73-12760 8G

Rational Design of Well Screens,
W73-12771 8B

Water Levels Near a Well Discharging From an Unconfined Aquifer,
W73-12777 4B

The Design and Operation of Deep-Well Disposal System,
W73-12780 5E

AQUIFER CHARASTICS
Simplified Solution for Decreasing Flow in Wells,
W73-12759 8B

AQUIFERS
Geology of Nelson and Walsh Counties, North Dakota,
W73-12579 2F

ARABIKA MASSIF
Karst of the Arabika Massif (Karst massiva Arabika),
W73-12742 2K

ARCTIC COASTAL ZONE
Simulations of Meteorological Variations Over Arctic Coastal Tundra Under Various Physical Interface Conditions,
W73-12983 2B

ARID-URBANIZING AREAS
Mathematical Modeling of Water Management Strategies in Urbanizing River Basins,
W73-12509 5G

ARIZONA
Sixteenth Annual Arizona Watershed Symposium Proceedings.
W73-12403 4D

Wildlife Habitat Improvement in Relation to Watershed Management in the Southwest,
W73-12404 4D

Responses od Deer and Elk to Beaver Creek Watershed Treatments,
W73-12405 4D

A Treatment Prescription for Improving Big Game Habitat in Ponderosa Pine Forests,
W73-12406 4D

Measuring Public Responses to Vegetative Management,
W73-12408 4D

Valuation of Timber, Forage and Water from National Forest Lands,
W73-12701 6B

ARKANSAS VALLEY (COLO)
Report on Arkansas Valley Conduit for Southeastern Colorado Water Conservancy District, Four Corners Regional Commission and U.S. Bureau of Reclamation.
W73-12577 4A

AROMATIC COMPOUNDS
Aromatic Hydroxylation as an Analytical Reaction,
W73-12853 5A

ARSENIC
Arsenic and Cadmium in the Environment,
W73-12607 5C

ARTESIAN AQUIFER
The Design and Operation of Deep-Well Disposal System,
W73-12780 5E

ARTESIAN AQUIFERS
Environmental Isotopes and Circulation in Aquifers Under Venice (Isotopes du Milieu et Circulations dans les Aquiferes du Sous-Sol Venitien),
W73-12419 2F

ARTIFICIAL AERATION
Biological Effects of Artificial Destratification and Aeration in Lakes and Reservoirs-Analysis and Bibliography,
W73-12625 5C

ARTIFICIAL DESTRATIFICATION
Biological Effects of Artificial Destratification and Aeration in Lakes and Reservoirs-Analysis and Bibliography,
W73-12625 5C

ARTIFICIAL RECHARGE
Artificial Recharge of Groundwater and Infiltration Basins (Iskusstvennoye vospolneniye zapasov i infil'tratsionnyye vodozabory podzemnykh vod),
W73-12745 4B

ASSIMILATION
The Mechanisms of Nitrogen Assimilation in Pseudomonads,
W73-12881 5C

ATHABASKA RIVER (N.S.)
Steam Distillation: A Simple Technique for Recovery of Petroleum Hydrocarbons from Tainted Fish,
W73-12849 5A

ATLANTIC OCEAN
The Zooplankton of the Gulf of Guinea,
W73-12623 5A

ATLANTIC SALMON
Swimming Performance of Young Atlantic Salmon (Salmo salar) as Affected by Reduced Ambient Oxygen Concentration,
W73-12897 5C

ATOMIC ABSORPTION SPECTROPHOTOMETERS
An Improved AA Microsampling System,
W73-12865 5A

ATOMIC ABSORPTION SPECTROPHOTOMETRY
Determination of Lead in Petroleum Additives Using Atomic Absorption Spectrophotometry,
W73-12864 5A

Stream-Velocity Effects on the Heavy-Metal Concentrations,
W73-12870 5B

ATRAZINE
Simultaneous Detection of the Residues of Atrazine and Linuron in Water, Soil, Plant, and Animal Samples by Thin-layer Chromatography,
W73-12811 5A

ATTENUATION
The Reduction of Copper Toxicity in a Marine Copepod by Sediment Extract,
W73-12909 5C

ATTITUDES
Measuring and Developing Methods of Attitude and Motivational Change in Implementing the Big Blue River Basin Water Plan,
W73-12491 6B

AUSTRALIA
Large Hydraulic Gates and Valves in the Snowy Mountain Scheme--A Review of Practice,
W73-12476 8C

Reservoir-Yield Estimation Procedures,
W73-12478 4A

Turbine Design and Performance for the Mersey-Forth Hydro Power Development,
W73-12486 8C

A Suggested New Approach to the Analysis of Drainage Basin Shapes,
W73-12729 4A

Frost Resistance in Eucalyptus: A New Method for Assessment of Frost Injury in Altitudinal Provenances of E. Viminalis,
W73-12815 2I

Viruses Infecting Peaches in the Murrumbidgee Irrigation Areas of New South Wales,
W73-12981 3F

AUSTRIA
Methods for the Further Improvement of Spent Liquor Recovery in Lenzing,
W73-12524 5D

AZOTOBACTER
Flow of Microbially Fixed Nitrogen in a Model Ecosystem,
W73-12847 5B

BACKWATER
Computing Backwater at Open Channel Constrictions,
W73-12415 8B

BACTERIA
Bacteria of Muds Colonized by Spartina Townsendii and their Possible Role in Spartina Die-Back,
W73-12705 2L

Handbook of Fish Diseases for Veterinarians and Biologists,
W73-12813 5C

Sources of CO2 for Nuisance Blooms of Algae,
W73-13000 5C

BACTERIAL PHYSIOLOGY
Bacterial Degradation of Detergent Compounds,
W73-12938 5B

BACTERIOPHAGE
Use of Coliphages as Indicators of Water pollution,
W73-12525 5A

BAJA CALIFORNIA (MEXICO)
Process-Form Variability of Multiclass Coasts: Baja California,
W73-12422 2L

BAKERY INDUSTRY
A Descriptive Analysis of the Bakery Products Industry Detailing Industry Trends and Characteristics Relevant to Economic Impact Analysis of Environmental Standards. Part II.
W73-12709 5G

A Study of the Impact of Pollution Standards and Charges on the Bakery Industry. Part III.
W73-12710 5G

BALD CYPRESS
Nutrient Uptake by Tupelo Gum and Bald Cypress from Saturated or Unsaturated Soil,
W73-12828 2I

BALTIMORE
Regional Sewer System, Planning and Cost Estimation Model,
W73-12357 5G

BALTIMORE HARBOR
An Evaluation of Baltimore Harbor Land Use Potentials,
W73-12361 6B

BALTIMORE REGION
Outdoor Recreation in the Baltimore Area.
W73-12360 6D

BARSTOW AREA (CALIF)
Selected Data on Wells in the Barstow Area, Mojave River Basin, California,
W73-12421 4B

BASALTS
Physical Characteristics of Basalt Aquifers,
W73-12523 4B

BASELINE STUDIES
Trace Metal Baseline Studies on the Murderkill and St Jones Rivers, Delaware Coastal Plain,
W73-12959 5B

BAYS
Biogeochemistry of Sediments of Delaware Bay,
W73-12739 2L

Investigation of the Nature, Extent and Fate of Natural Oil Seepage Off Southern California,
W73-12958 5B

BEACH EROSION
Final Environmental Statement: Small Beach Erosion Control Project, Broadkill Beach, Delaware.
W73-12430 8B

Grays Harbor Estuary, Washington: Report 2. North Jetty Study,
W73-12581 8B

Forecasting Storm-Induced Beach Changes Along Virginia's Ocean Coast,
W73-12584 4A

BEACH PROFILE CHANGES
Forecasting Storm-Induced Beach Changes Along Virginia's Ocean Coast,
W73-12584 4A

BEAN ROOTS
Effect of Time, Water Flow and pH on Centripetal Passage of Radiophosphorus Across Roots of Intact Plants,
W73-12991 5B

BEARING CAPACITY
Bearing Capacity of Footings in Plane Strain,
W73-12484 8D

BEDFORD BASIN (N.S.)
Annual Life Cycle and Production of the Chaetognath Sagitta elegans in Bedford Basin, Nova Scotia,
W73-12898 5B

BEHAVIOR
Measuring and Developing Methods of Attitude and Motivational Change in Implementing the Big Blue River Basin Water Plan,
W73-12491 6B

BENEFICIATION
Study of Utilization and Disposal of Lime Sludges Containing Phosphates,
W73-12501 5D

BENTHIC FAUNA
The Benthic Fauna in Four Small Southern Appalachian Streams,
W73-12784 2I

Community Structure of the Benthos in Scottish Sea-Lochs. II. Spatial Pattern,
W73-12855 5C

BENTHIC FLORA
The Physiognomy and Structure of the Benthic Macrophyte Communities on Rocky Shores in the Southwestern Archipelago of Finland (Seili Islands),
W73-12929 5A

BENTHIC INVERTEBRATES
Benthic Invertebrates in Lake Ashtabula Reservoir, North Dakota,
W73-12863 5C

BENTHOS
Community Structure of the Benthos in Scottish Sea-Lochs. II. Spatial Pattern,
W73-12855 5C

Some Effects of Evaporation Suppression on Reservoir Ecology,
W73-12869 5C

BERMUDA GRASS
Land Disposal of Liquid Sewage Sludge: I. The Effect on Yield, in Vivo Digestibility, and Chemical Composition of Coastal Bermudagrass (Cynodon dactylon L. Pers.),
W73-12914 5D

BIBLIOGRAPHIES
Water Pollution in the Pulp and Paper Industry. I. General and In-Plant Modifications,
W73-12553 5D

Water Pollution in the Pulp and Paper Industry. II. Testing Methods,
W73-12554 5A

Water Pollution in the Pulp and Paper Industry. III. Stream Response,
W73-12555 5C

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. A. Physical Operations,
W73-12556 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. B. Biological Systems,
W73-12557 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. C. Chemical Processes, General Observations, and Reports,
W73-12558 5D

Horton's 1945 Study: A Cartobibliography,
W73-12596 7C

Biological Effects of Artificial Destratification and Aeration in Lakes and Reservoirs-Analysis and Bibliography,
W73-12625 5C

Biological Effects of Oil Pollution - Selected Bibliography II,
W73-12626 5C

Biological Aspects of Lead: An Annotated Bibliography - Literature From 1950 through 1964. Parts I and II,
W73-12627 5C

Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol I - Chemistry,
W73-12753 2H

Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol II - Biology,
W73-12754 2H

Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol III - Physical,
W73-12755 2H

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W73-12953 2A

Publications of Water Resources Investigations in Colorado and Selected Publications Pertaining to Colorado.
W73-12954 2A

BIG BLUE RIVER BASIN WATER PLAN
Measuring and Developing Methods of Attitude and Motivational Change in Implementing the Big Blue River Basin Water Plan,
W73-12491 6B

BIG GAME
Responses od Deer and Elk to Beaver Creek Watershed Treatments,
W73-12405 4D

A Treatment Prescription for Improving Big Game Habitat in Ponderosa Pine Forests,
W73-12406 4D

BIOASSAY
Algal Bioassays: Examples, Advantages, and Limitations of Current Approaches,
W73-12400 5C

AGP Studies in the San Francisco Bay-Delta,
W73-12401 5C

The TTC Test for the Control of Effluent Purification (Test TTC - Narzedziem kontroli procesu oczyszczania),
W73-12535 5D

The Effects of Sublethal Concentrations of Whole Bleached Kraftmill Effluent on the Growth and Food Conversion Efficiency of Underyearling Sockeye Salmon (Oncorhynchus nerka),
W73-12913 5C

BIOCHEMICAL OXYGEN DEMAND
Pitfalls and Procedures in BOD Tests,
W73-12527 5A

Determination of Organic Substances in Industrial Effluents (Nektere moznosti stanoveni organickeho znecisteni odpadnich vod),
W73-12532 5A

The Disposal of Wastewater Underground,
W73-12781 5E

BIOCHEMISTRY
Aspects of the Biogeochemistry of Carbohydrates and Proteins in Aquatic Environments,
W73-12371 5C

The Role of Heavy Metals in Biology,
W73-12613 5C

Biogeochemistry of Sediments of Delaware Bay,
W73-12739 2L

BIODEGRADATION
Selective Substrate Utilization by Marine Hydrocarbonoclastic Bacteria,
W73-12621 5B

BIODEGRADATION

Investigation of the Environmental Factors Which Affect the Anaerobic Decomposition of Fibrous Sludge Beds on Stream Bottoms,
W73-12936 5B

BIOINDICATORS

Use of Coliphages as Indicators of Water pollution,
W73-12525 5A

Some Short-Term Indicators of Sublethal Effects of Copper on Brook Trout, Salvelinus Fontinalis,
W73-12859 5C

Behavior of the Goldfish as an Early Warning System for the Presence of Pollutants in Water,
W73-12916 5A

BIOLOGICAL COMMUNITIES

Proceedings of Seminar on Eutrophication and Biostimulation.
W73-12391 5C

Community Structure of the Benthos in Scottish Sea-Lochs. II. Spatial Pattern,
W73-12855 5C

Stream-Velocity Effects on the Heavy-Metal Concentrations,
W73-12870 5B

The Physiognomy and Structure of the Benthic Macrophyte Communities on Rocky Shores in the Southwestern Archipelago of Finland (Seili Islands),
W73-12929 5A

BIOLOGICAL EFFECTS

Biological Effects of Artificial Destratification and Aeration in Lakes and Reservoirs-Analysis and Bibliography,
W73-12625 5C

BIOLOGICAL PROPERTIES

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W73-12754 2H

Biomass Characteristics of the Asidian Molgula Manhattensis (Dekay),
W73-12880 5A

BIOLOGICAL TREATMENT

Wastewater Treatment System,
W73-12455 5D

Stabilization of Sewage Solids by the Channel Aeration Process,
W73-12502 5D

Start-up of Biological Treatment Facilities for Pulp and Paper Mill Wastes,
W73-12531 5D

Microbiological Treatment Parameters of Bleached Kraft Pulp Mill Effluents,
W73-12551 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. B. Biological Systems,
W73-12557 5D

BIOMASS

Biomass Characteristics of the Asidian Molgula Manhattensis (Dekay),
W73-12880 5A

Annual Life Cycle and Production of the Chaetognath Sagitta elegans in Bedford Basin, Nova Scotia,
W73-12898 5B

The Physiognomy and Structure of the Benthic Macrophyte Communities on Rocky Shores in the Southwestern Archipelago of Finland (Seili Islands),
W73-12929 5A

BIOMONITORING

Uptake of Mercury by Caged Rainbow Trout (Salmo Gairdneri) in the South Saskatchewan River,
W73-12857 5C

The Use of Fish as Sensors in Industrial Waste Lines to Prevent Fish Kills,
W73-12889 5C

Behavior of the Goldfish as an Early Warning System for the Presence of Pollutants in Water,
W73-12916 5A

BIOTURBATION

Characteristic Physical and Biogenic Sedimentary Structures in Georgia Estuaries,
W73-12410 2L

BITYUG RIVER

Methods of Determining Soil Moisture Storage in Winter (K metodike opredeleniya vlagozapasov pochvy v zimniy period goda),
W73-12444 2G

BLACK COTTON SOILS

The Quality of Drainage Water from Irrigated Black Cotton Soils for Irrigation,
W73-12650 3F

BLACK CRAPPIE

Length-Weight Relationship and Condition Factors of Fishes From a South Carolina Reservoir Receiving Thermal Effluent,
W73-12774 5C

BLACK LIQUORS

Detoxification of Kraft Pulp Mill Effluent by an Aerated Lagoon,
W73-12529 5D

BLEACHING

Advanced Pollution Abatement Technology in the Pulp and Paper Industry.
W73-12552 5D

BLEACHING WASTES

Ion Exchange Color and Mineral Removal from Kraft Bleach Wastes,
W73-12522 5D

The Problem of Color Measurement for Pulp Manufacturing Effluents (Le probleme de la mesure de couleur des effluents de fabrication des pates),
W73-12526 5G

The Effects of Sublethal Concentrations of Whole Bleached Kraftmill Effluent on the Growth and Food Conversion Efficiency of Underyearling Sockeye Salmon (Oncorhynchus nerka),
W73-12913 5C

BLOOD

Optimum Procedure for the Determination of Selenium in Biological Specimens Using Se-77m Neutron Activation,
W73-12876 5A

BLUE LAKE (MANITOBA)

A Relationship between Heterotrophic Utilization of Organic Acids and Bacterial Populations in West Blue Lake, Manitoba,
W73-12903 5C

BLUEGILL

Length-Weight Relationship and Condition Factors of Fishes From a South Carolina Reservoir Receiving Thermal Effluent,
W73-12774 5C

BLUEGILLS

The Use of Fish as Sensors in Industrial Waste Lines to Prevent Fish Kills,
W73-12889 5C

BLUEGILLS MORTALITY

Mortality Curves of Bluegills (Lepomis Macrochirus Rafinesque) Simultaneously Exposed to Temperature and Zinc Stress,
W73-12637 5C

BOARD MILLS

River Thames Antipollution: Boardmakers Install World's Largest Tidal River Surface Aerator.
W73-12548 5G

Aeration of the Thames.
W73-12549 5G

Large Surface Aerator Designed to Condition Board Mill Effluent.
W73-12550 5G

BOATS

Survey of Water Transportation Potential to Reduce Congestion and Pollution in Washington, D.C. and Other Major Cities.
W73-12363 5G

BOLSONS

Presidio Bolson, Trans-Pecos Texas and Adjacent Mexico: Geology of a Desert Basin Aquifer System,
W73-12585 2F

BOLTED JOINTS

High Strength Bolted Galvanized Joints,
W73-12489 8G

BOREHOLE GEOPHYSICS

Physical Characteristics of Basalt Aquifers,
W73-12523 4B

New Applications of Geophysical Methods to Ground-Water Problems in Pennsylvania,
W73-12783 2F

BORON

Effect of Environmental Factors on Water Utilization and Boron Accumulation and Translocation in Sugarcane,
W73-12966 3F

BOSTON HARBOR

Lipids in Shallow Bottom Sediments,
W73-12717 5B

BOTANY

Botany Along Sonamarg to Trunkhal,
W73-12657 2I

BOTTOM SEDIMENTS

Lead Pollution: Records in Southern California Coastal Sediments,
W73-12589 5B

Sea Floor Off Magdalena Delta and Santa Marta Area, Colombia,
W73-12591 2J

Effects of Fertilization on Aquatic Plants, Water and Bottom Sediments,
W73-12661 5C

Lipids in Shallow Bottom Sediments,
W73-12717 5B

The Reduction of Copper Toxicity in a Marine Copepod by Sediment Extract,
W73-12909 5C

Determination of Alkylbenzenesulfonate (ABS) in Bottom Sediment,
W73-12932 5A

Trace Metal Baseline Studies on the Murderkill and St Jones Rivers, Delaware Coastal Plain,
W73-12959 5B

BOTTOM SEDIMENTS (ESTUARINE)
A Cage for Exposing Aquatic Animals to Bottom Sediments,
W73-12372 2L

BOWEN-RATIO METHOD
Average Bowen-Ratio Methods of Calculating Evaportranspiration Applied to a Douglas Fir Forest,
W73-12801 2D

BREEDING
The Size at Maturity and Breeding Seasons of Sardines in Southern Lake Tanganyika,
W73-12649 2H

BRINE DISPOSAL
Ground Water Pollution in the South Central States,
W73-12515 5B

Recondition and Reuse of Organically Contaminated Waste Sodium Chloride Brines,
W73-12521 5D

Problems of Groundwater Pollution by Brine,
W73-12770 5B

BRINE REUSE
Recondition and Reuse of Organically Contaminated Waste Sodium Chloride Brines,
W73-12521 5D

BRINES
Wind-Driven Model for Evaporite Deposition in a Layered Sea,
W73-12594 2J

BRITISH COLUMBIA
Microbiological Treatment Parameters of Bleached Kraft Pulp Mill Effluents,
W73-12551 5D

BRITISH WEST INDIES
Heat and Water Balance Studies on Grand Cayman,
W73-12822 2D

BROADKILL BEACH (DEL)
Final Environmental Statement: Small Beach Erosion Control Project, Broadkill Beach, Delaware.
W73-12430 8B

BROMINE DISINFECTION
Disinfection of Sewage Effluents,
W73-12504 5D

BROOK TROUT
Some Short-Term Indicators of Sublethal Effects of Copper on Brook Trout, Salvelinus Fontinalis,
W73-12859 5C

BROWN TROUT
Metabolic Effects of PCB (Polychlorinated Biphenyls) on the Brown Trout (Salmo trutta),
W73-12819 5C

BRUCINE
Rapid Field Determination of Nitrate in Natural Waters,
W73-12810 2K

BUFFALO CREEK (W VA)
Buffalo Creek Dam Disaster: Why It Happened,
W73-12411 4C

BULK DENSITY
Some Hydrophysical Characteristics of Soils in the Don River Basin to Kazanskaya Station (Nekotoryye vodno-fizicheskiye kharakteristiki pochv basseyna r. Dona do st-tsy Kazanskoy),
W73-12443 2G

BUNDLED CONDUCTORS
Energy Method for Computing the Amplitude of Vibration of Conductor Bundles Due to Wake Effect,
W73-12480 8C

BURBOT
Age, Growth Reproduction, and Food of the Burbot, Lota lota (Linnaeus), in Southwestern Lake Superior,
W73-12934 2H

BUTT JOINTS
Welding of a Normalized High Strength Low Alloy Plate Steel of Structural Quality,
W73-12466 8G

CADMIUM
Arsenic and Cadmium in the Environment,
W73-12607 5C

CAIRO (NEW YORK)
Town of Cairo Waste Water Report.
W73-12366 5D

CALCAREOUS SOILS
Determination of Exchangeable Cations in Calcareous Soils,
W73-12786 2G

CALCIUM CARBONATE
Observations of Tufa Deposition,
W73-12730 2K

Determination of Exchangeable Cations in Calcareous Soils,
W73-12786 2G

CALIFORNIA
Proceedings of Seminar on Eutrophication and Biostimulation.
W73-12391 5C

Nitrogen: Recent Studies on the Role of Nitrogen in the Biostimulation and Eutrophication of Aquatic Ecosystems,
W73-12393 5C

Phosphorus and Eutrophication,
W73-12394 5C

Effects of Light and Temperature on Algal Growth,
W73-12396 5C

Nutrient Control in North San Francisco Bay,
W73-12398 5C

Mathematical modeling of Phytoplankton Populations,
W73-12399 5C

AGP Studies in the San Francisco Bay-Delta,
W73-12401 5C

Selected Data on Wells in the Barstow Area, Mojave River Basin, California,
W73-12421 4B

A Pilot Fish-Pond System for Utilization of Sewage Effluents, Humboldt Bay, Northern California,
W73-12434 5D

Field Leaching by Sprinkler and Surface Irrigation During a Crop Season,
W73-12464 3F

California Power Plant Siting Study: Volumes, I, II, and III.
W73-12574 5G

Lead Pollution: Records in Southern California Coastal Sediments,
W73-12589 5B

Soil Nitrogen Balance in Selected Row-Crop Sites in Southern California,
W73-12670 3F

Water Quality in the Middle Fork Feather River, California, May 1970 Through September 1971,
W73-12720 5A

Optical Properties and Color of Lake Tahoe and Crater Lake,
W73-12926 5A

Reports for California by the Geological Survey Water Resources Division.
W73-12953 2A

Investigation of the Nature, Extent and Fate of Natural Oil Seepage Off Southern California,
W73-12958 5B

Contributions to the Life History of the Piute Sculpin in Sagehen Creek, California,
W73-12986 2I

Primary Productivity in a New and an Older California Reservoir,
W73-12998 8I

CALIFORNIA (HAYFORK CREEK)
The Effects of Diesel Fuel on a Stream Fauna,
W73-12997 5C

CALORIMETRY
A Nitrogen Correction for Caloric Values,
W73-12383 5A

CALUMET RIVER (ILL.)
Lithium Silicate Sedimentation Tracer for Shoal Deposit Studies,
W73-12862 5B

CANADA
Some Effects of Artificial Fertilization on Enclosed Plankton Populations in Marion Lake, British Columbia,
W73-12384 5C

Detoxification of Kraft Pulp Mill Effluent by an Aerated Lagoon,
W73-12529 5D

Ontario Unhappy with Efforts of Industry to Halt Pollution,
W73-12538 5G

Microbiological Treatment Parameters of Bleached Kraft Pulp Mill Effluents,
W73-12551 5D

Lake Movements with Partial Ice Cover,
W73-12663 2H

CANADA

Steam Distillation: A Simple Technique for Recovery of Petroleum Hydrocarbons from Tainted Fish,
W73-12849 5A

Uptake of Mercury by Caged Rainbow Trout (Salmo Gairdneri) in the South Saskatchewan River,
W73-12857 5C

Annual Life Cycle and Production of the Chaetognath Sagitta elegans in Bedford Basin, Nova Scotia,
W73-12898 5B

A Relationship between Heterotrophic Utilization of Organic Acids and Bacterial Populations in West Blue Lake, Manitoba,
W73-12903 5C

Simulation Study of Phytoplankton Photosynthesis and Growth in the Fraser River Estuary,
W73-12919 5C

Mercury in Canadian Fish,
W73-12970 5C

Fluoridation or Fluoride Supplements: A Statement by the Nutrition Committee, Canadian Paediatric Society.
W73-12990 5G

CANADA (BRITISH COLUMBIA ESTUARY)
A Record of Pacific Herring (Clupea harengus Pallasi) Feeding on Juvenile Chinook Salmon (Oncorhynchus tshawytscha) in a British Columbia Estuary,
W73-12375 2L

CANADA (NEW BRUNSWICK)
Waterfowl Utilization of Beaver Ponds in New Brunswick,
W73-12662 2I

CANADA (NORTHUMBERLAND STRAIT)
Biology of Rock Crab (Cancer Irroratus) in Northumberland Strait,
W73-12390 2L

CANAL CONSTRUCTION
Cost Curves for Cross-Drainage Works,
W73-12704 4A

CANALS
The Computation of Tides and Currents in Estuaries and Canals,
W73-12428 2L

Standing Crops of Natural Fish Populations in Brackish-Water Oil Field Pipeline Canals,
W73-12952 5C

CAPILLARY WATER
Soviet Study Shows Polywater Doesn't Exist.
W73-12540 1B

CARASSIUS AURATUS
Behavior of the Goldfish as an Early Warning System for the Presence of Pollutants in Water,
W73-12916 5A

CARBOHYDRATES
Aspects of the Biogeochemistry of Carbohydrates and Proteins in Aquatic Environments,
W73-12371 5C

CARBON
The Effect of Inorganic Carbon on Eutrophication,
W73-12392 5C

Waste Water Purification by Breakpoint Chlorination and Carbon Adsorption,
W73-12459 5D

CARBON CYCLE
Carbon Cycle in Sediment-Water Systems,
W73-12846 5C

CARBON DIOXIDE
Hydrostatic Pressure in Relation to the Synchronous Culture of Algae in Open and Closed Systems,
W73-12798 5C

CARPSUCKER
Studies on Helminths of North Dakota: IV. Parasites of the River Carpsucker, Carpiodes carpio, with Descriptions of Three New Species (Monogenea),
W73-12984 2I

CARROTS
Water Pathways in Higher Plants: II. Water Pathways in Roots,
W73-12651 2I

CATFISH (FINGERLINGS)
Rearing Channel Catfish Fingerlings Under Intensive Culture Conditions,
W73-12488 8I

CATFISH VIRUS
Fish Viruses: Histopathologic Changes Associated with Experimental Channel Catfish Virus Disease,
W73-12382 5C

CATHODIC DEPOLARIZATION
Corrosion by the Sulphate-Reducing Bacteria,
W73-12756 5G

CATHODIC PROTECTION
Cathodic Protection for Coated Steel Pipelines,
W73-12765 8G

CATION EXCHANGE
Determination of Exchangeable Cations in Calcareous Soils,
W73-12786 2G

CATIONS
Sodium Relations in Desert Plants: 1. Cation Contents of Some Plant Species from the Mojave and Great Basin Deserts,
W73-12792 2I

Sodium Relations in Desert Plants: 2. Distribution of Cations in Plant Parts of Three Different Species of Atriplex,
W73-12793 2I

CATTLE
Demostration of a Waste Disposal System for Livestock Waste,
W73-12517 5D

CAYMAN ISLANDS
Black Phytokarst From Hell, Cayman Islands, British West Indies,
W73-12593 2J

CELL MORPHOLOGY
A Study of Inorganic Salts Requirements and Effect on the Morphology of Marine Bacteria,
W73-12628 5C

CELLULOSE
Investigations on Waste Water Clarification with Activated Carbon (Untersuchungen zur Restabwasserklarung mit Aktivkohle),
W73-12543 5D

CEMENT
Leaching of Cement from a Concrete Pile Section by Groundwater Flow,
W73-12766 8F

CENTER-PIVOT SPRINKLER
Improvements in Moving Sprinkler Irrigation Systems for Conservation of Water,
W73-12507 3F

CEPHALOSPORIUM-GRAMINEUM
Influence of Water Potential on Growth, Antibiotic Production and Survival of Cephalosporium gramineum,
W73-12999 5B

CERTIFICATION PROGRAMS
WPCF Project Report: A State Certification Program Guide,
W73-12842 5G

CHAETOGNATHS
Annual Life Cycle and Production of the Chaetognath Sagitta elegans in Bedford Basin, Nova Scotia,
W73-12898 5B

CHAIN OF ROCKS CANAL
Shoaling Conditions, St. Louis Harbor, Mississippi River; Hydraulic Model Investigation,
W73-12570 8B

CHANNEL CATFISH
Fish Viruses: Histopathologic Changes Associated with Experimental Channel Catfish Virus Disease,
W73-12382 5C

Rearing Channel Catfish Fingerlings Under Intensive Culture Conditions,
W73-12488 8I

Use of Cold Brands on Channel Catfish,
W73-12778 8I

Mariculture in Estuarine Oil-Pipeline Canals in Louisiana,
W73-12951 5C

CHANNEL EROSION
Channel Erosion Surveys Along Proposed Taps Route, Alaska, July 1971,
W73-12957 2J

CHANNEL IMPROVEMENT
Chena River Lakes Project, Alaska, Problems Relating to Channel Development, Erosion, and Bank and Levee Protection,
W73-12559 8B

Navigation Channel Improvement, Gastineau Channel, Alaska; Hydraulic Model Investigation,
W73-12571 8A

Maintenance of the Hudson River Channel, New York, Navigation Project, (Final Environmental Statement).
W73-12588 8B

CHARGED PARTICLES
Electrostatic Crop Spraying,
W73-12482 3F

CHELATES
Water Pathways in Higher Plants: III. The Transpiration Stream Within Leaves,
W73-12652 2I

CHELATION
Process and Apparatus for Removing Mercury from Waste Water,
W73-12449 5D

CHEMCONTROL
Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. C. Chemical Processes, General Observations, and Reports,
W73-12558 5D

CHEMICAL ANALYSIS
Upper Chesapeake Bay Water Quality Studies, 1968-1971.
W73-12601 5A

Problems in the Analysis of Trace Metals,
W73-12608 5A

Transport of Heavy Metals Through the Air Environment,
W73-12609 5B

Water Quality in the Middle Fork Feather River, California, May 1970 Through September 1971,
W73-12720 5A

Aromatic Hydroxylation as an Analytical Reaction,
W73-12853 5A

Sodium Tungsten Bronze as a Potentiometric Indicating Electrode for Dissolved Oxygen in Aqueous solution,
W73-12873 5A

Thorium in Water and Algae from the Adriatic Sea,
W73-12927 5A

Chemistry and Trophic Status of Seven New Zealand Lakes,
W73-12928 5C

Analytical Reviews 1973/Applications.
W73-12930 5A

CHEMICAL COMPOSITION
Effect of Incubation Temperature on the Macromolecular and Lipid Content of the Phytoflagellate Ochromonas danica,
W73-12896 5C

CHEMICAL COMPOSITION (GRASSES)
Growth and Chemical Composition of Eight Grasses Grown Under High Water Table Conditions,
W73-12972 2I

CHEMICAL GROUTING
Guide Specification for Chemical Grouts.
W73-12782 8G

CHEMICAL PRECIPITATION
Wind-Driven Model for Evaporite Deposition in a Layered Sea,
W73-12594 2J

Observations of Tufa Deposition,
W73-12730 2K

CHEMICAL PROPERTIES
Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol 1 - Chemistry,
W73-12753 2H

CHEMICAL REACTIONS
Corrosion by the Sulphate-Reducing Bacteria,
W73-12756 5G

Comparison of Waterflood Corrosion Detection and Monitoring Devices,
W73-12757 8G

Sand Control - 3. Chemical Consolidation,
W73-12760 8G

Here's a New Sand Pack Method,
W73-12761 8G

Corrosion of Metals in Tropical Waters---Structural Ferrous Metals,
W73-12772 8G

Galvanic Corrosion of Metals in Cementing Materials,
W73-12775 8G

Aromatic Hydroxylation as an Analytical Reaction,
W73-12853 5A

CHEMICAL RECOVERY
Rayonier Makes Major Breakthrough in Sulfite Pollution Control.
W73-12542 5D

CHEMICAL SLUDGES
Characterization of Chemical Sludges,
W73-12871 5A

CHEMICAL WASTES
Identification and Control of Petrochemical Pollutants Inhibitory to Anaerobic Processes,
W73-12513 5D

CHEMICALS
Control of Oil and Other Hazardous Materials.
W73-12427 5G

CHEMUNG RIVER
Annual Report of the New York State Urban Development Corporation, 1972.
W73-12356 3D

CHENA RIVER (ALAS)
Chena River Lakes Project, Alaska, Problems Relating to Channel Development, Erosion, and Bank and Levee Protection,
W73-12559 8B

CHERNOZEMS
Characteristics of Water Migration in a Thick Leached Chernozem (Osobennosti dvizheniya vody v vyshchelochennom moshchnom chernozeme),
W73-12743 2G

Hydrophysical Properties and Water Regime of Crimean Southern Chernozems in a Field Crop Rotation (Vodno-fizicheskiye svoystva i vodnyy rezhim yuzhnykh chernozemov Kryma v polevom sevooborote),
W73-12744 2G

Water Regime in a Crop Rotation on Chernozem Soils in Southeast Russia (Vodnyy rezhim v sevooborote na chernozemnykh pochvakh Yugo-Vostoka),
W73-12747 2G

CHERRY FRUIT
Antitranspirant Film: Curtailing Intake of External Water by Cherry Fruit to Reduce Cracking,
W73-12992 2D

CHESAPEAKE BAY
Upper Chesapeake Bay Water Quality Studies, 1968-1971.
W73-12601 5A

CHICAGO
The Lakefront Plan of Chicago.
W73-12367 4C

CHICAGO RIVER (ILL)
Viruses in Metropolitan Waters: Concentration by Polyelectrolytes, Freeze Concentration, and Ultrafiltration,
W73-12867 5F

CHIRONOMIDAE
Biologically Active Compounds in the Aquatic Environment: The Uptake and Distribution of (1,1-Dichloro-2,2-Bis (P-Chlorophenyl) Ethylene), DDE by Chironomus tentans Fabricius (Diptera: Chironomidae),
W73-12804 5B

CHITA OBLAST
Hydrochemical Description of the Onon-Argun' Steppe (Gidrokhimicheskaya kharakteristika Onon-Argunskoy stepi),
W73-12746 2K

CHLORELLA-ELLIPSOIDEA
Hydrostatic Pressure in Relation to the Synchronous Culture of Algae in Open and Closed Systems,
W73-12798 5C

CHLORINATION
Waste Water Purification by Breakpoint Chlorination and Carbon Adsorption,
W73-12459 5D

CHLORINE
The Evaluation of Existing Field Test Kits for Determining Free Chlorine Residuals in Aqueous Solutions,
W73-12426 5A

Disinfection of Sewage Effluents,
W73-12504 5D

CHLORINE TEST KITS
The Evaluation of Existing Field Test Kits for Determining Free Chlorine Residuals in Aqueous Solutions,
W73-12426 5A

CHLORINITY
Fungi Colonizing Wood Submerged in the Medway Estuary,
W73-12825 2L

CHLOROPHYLL
Laser Induced Fluorescence in Algae: A New Technique for Remote Detection,
W73-12841 5A

CHOLINESTERASE
An Immobilized Cholinesterase Product for Use in the Rapid Detection of Enzyme Inhibitors in Air or Water,
W73-12901 5A

CHROMATOGRAPHY (THIN LAYER)
Simultaneous Detection of the Residues of Atrazine and Linuron in Water, Soil, Plant, and Animal Samples by Thin-layer Chromatography,
W73-12811 5A

CIRQUES
Trials on Trends Through Clusters of Cirques,
W73-12732 2J

CISTERNS
Insecticide Residues in Water and Sediment from Cisterns on the U.S. and British Virgin Islands - 1970,
W73-12894 5B

CITIES
Systems Approach to Metropolitan and Regional Area Water and Sewer Planning,
W73-12351 6A

Coordination of Agricultural and Urban Water Quality Management in the Utah Lake Drainage Area,
W73-12508 5G

Evaluation of Urban Water Management Policies in the Denver Metropolitan Area,
W73-12510 5G

CITRUS
Diurnal and Seasonal Effects of Environment on Plant Water Relations and Fruit Diameter of Citrus,
W73-12805 3F

Evaluation of Tensiometers for Estimating Plant Water Stress in Citrus,
W73-12985 3F

Antitranspirants for Conservation of Leaf Water Potential of Transplanted Citrus Trees,
W73-12993 2D

CITY PLANNING
Comprehensive Public Water Supply Study for Schenectady County, New York.
W73-12358 3D

Summary Report: Comprehensive Sewerage Study for Schenectady County, New York.
W73-12359 5G

The Lakefront Plan of Chicago.
W73-12367 4C

Stream Quality Preservation Through Planned Urban Development,
W73-12518 5G

CLASSIFICATION
Classification of Coastal Environments, Procedures and Guidelines,
W73-12433 2L

Some Marine Diatoms from the Galapagos Islands,
W73-12902 2I

Classification of the Coastal Environments of the World: Part II. Africa,
W73-12950 2L

CLAY COMPOSITION
Influence of Moisture Regime on the Genesis of Laterite Soils in South Inida: II. Clay Composition and Mineralogy,
W73-12721 2G

CLEAR CREEK (TEX)
Description and Ecology of Hyaiella Texana N. Sp. (Crustacea: Amphipoda) from the Edwards Plateau of Texas,
W73-12900 2I

CLEAR LAKE (CALIF)
Nitrogen: Recent Studies on the Role of Nitrogen in the Biostimulation and Eutrophication of Aquatic Ecosystems,
W73-12393 5C

CLIMATIC DATA
Climatology of Rainfall Probabilities for Oahu, Hawaii,
W73-12587 2B

CLOUD PHYSICS
On The Number Distribution of Hail Growing in Updrafts,
W73-12602 2B

Dynamics of a Falling Particle Zone,
W73-12603 2B

CLOUDS
Water Content in Convective Storm Clouds,
W73-12536 2B

COAGULATION
Fluidized Bed Clarification as Applied to Wastewater Treatment,
W73-12505 5D

COAL MINE WASTES
Buffalo Creek Dam Disaster: Why It Happened,
W73-12411 4C

Control of Mine Drainage from Coal Mine Mineral Wastes - Phase II - Pollution Abatement and Monitoring,
W73-12516 5G

COAST GUARD REGULATIONS
Proposed Oil Pollution Regulations, (Final Environmental Statement).
W73-12955 5G

COASTAL ENGINEERING
Final Environmental Statement: Small Beach Erosion Control Project, Broadkill Beach, Delaware.
W73-12430 8B

Grays Harbor Estuary, Washington: Report 2. North Jetty Study,
W73-12581 8B

COASTAL ENVIRONMENTS
Classification of the Coastal Environments of the World: Part II. Africa,
W73-12950 2L

COASTS
Process-Form Variability of Multiclass Coasts: Baja California,
W73-12422 2L

Classification of Coastal Environments, Procedures and Guidelines,
W73-12433 2L

Heavy Metals in Estuaries and the Coastal Zone,
W73-12606 5B

An Interdisciplinary Study of the Estuarine and Coastal Oceanography of Block Island Sound and Adjacent New York Coastal Waters,
W73-12629 5A

Classification of the Coastal Environments of the World: Part II. Africa,
W73-12950 2L

Investigation of the Nature, Extent and Fate of Natural Oil Seepage Off Southern California,
W73-12958 5B

COCCONEIS SCUTELLUM
Fouling on Eelgrass (Zostera Marina L.),
W73-12631 5G

CODIUM FRAGILE
Ecological Studies of Codium fragile in New England, USA,
W73-12918 5C

COLONIZATION
Fouling on Eelgrass (Zostera Marina L.),
W73-12631 5G

Dispersion, Dispersal, and Persistence of the Annual Intertidal Alga, Postelsia Palmeformis Ruprecht,
W73-12883 5C

COLOR
System for Removing Color From Paper Mill Liquid Waste,
W73-12445 5D

The Problem of Color Measurement for Pulp Manufacturing Effluents (Le probleme de la mesure de couleur des effluents de fabrication des pates),
W73-12526 5G

Practical Decolorization of Kraft Mill Effluents (Praktyka usuwania barwy sciekow posiarczanowych),
W73-12544 5D

Optical Properties and Color of Lake Tahoe and Crater Lake,
W73-12926 5A

COLOR REMOVAL
Ion Exchange Color and Mineral Removal from Kraft Bleach Wastes,
W73-12522 5D

COLORADO
Mathematical Modeling of Water Management Strategies in Urbanizing River Basins,
W73-12509 5G

Evaluation of Urban Water Management Policies in the Denver Metropolitan Area,
W73-12510 5G

Report on Arkansas Valley Conduit for Southeastern Colorado Water Conservancy District, Four Corners Regional Commission and U.S. Bureau of Reclamation.
W73-12577 4A

Cathodic Protection for Coated Steel Pipelines,
W73-12765 8G

Publications of Water Resources Investigations in Colorado and Selected Publications Pertaining to Colorado.
W73-12954 2A

COLORADO PLATEAU
The Interrelationships of the Vegetation Characters of Four Salt Desert Shrub Associations of Colorado Plateau,
W73-12791 3B

COLORADO RIVER
Mineral Pollution in the Colorado River Basin,
W73-12715 5B

COLORIMETRY
Determination of Alkylbenzenesulfonate (ABS) in Bottom Sediment,
W73-12932 5A

COLUMBIA RIVER
Particulate Manganese in Sea Water Stressing Regimes in Marine Anoxic Basins,
W73-12854 5A

COLUMNS
Strength Analysis of Corner Column-Slab Connections,
W73-12465 8A

COMBINED TREATMENT
Joint Treatment of Pulp Mill Effluents and Municipal Sewage.
W73-12528 5D

COMMERCIAL FISHING
Peruvian Fisheries: Conservation and Development.
W73-12689 6B

Extinction of a Fishery by Commercial Exploitation: A Note,
W73-12692 6B

Costs and Profitability in the Commercial Fishing Industry: The Insurance Dilemma,
W73-12699 6B

COMMUNITY DEVELOPMENT
A Study of Selected Aspects of Rural Water System Development in Mississippi,
W73-12492 6B

Economic and Related Impacts of Rural Water Systems in Mississippi,
W73-12493 6B

The Effect of Price and Other Selected Variables on Water Consumption,
W73-12495 6B

COMPARATIVE STUDIES
A Comparison of Liquid Scintillation and Geiger-Muller Estimates of Primary Productivity in an in Situ Experiment,
W73-12848 5A

Annual Production of a Stream Mayfly Population: A Comparison of Methods,
W73-12905 5B

COMPETING USES
Wildlife Habitat Improvement in Relation to Watershed Management in the Southwest,
W73-12404 4D

COMPREHENSIVE PLANNING
The Niagara River Pollution Abatement Progress - 1971.
W73-12380 5G

COMPUTER PROGRAMS
Regional Sewer System, Planning and Cost Estimation Model,
W73-12357 5G

Prediction of Unsteady Salinity Intrusion in Estuaries: Mathematical Model and User's Manual,
W73-12728 2L

Instrumental and Numerical Considerations for On-Line Interpretation of High Resolution Mass Spectral Data,
W73-12874 2K

CONCRETE TESTING
Tests of Selected Insulating Materials for Mass Concrete,
W73-12431 8F

CONDENSATION
High-Purity Distilled Water Producing Apparatus,
W73-12450 3A

Heat-Exchanger for Desalting Sea Water,
W73-12453 3A

CONFERENCES
Proceedings of Seminar on Eutrophication and Biostimulation.
W73-12391 5C

Heavy Metals in the Environment.
W73-12604 5B

CONFINED WATER
Environmental Isotopes and Circulation in Aquifers Under Venice (Isotopes du Milieu et Circulations dans les Aquiferes du Sous-Sol Venitien),
W73-12419 2F

CONNECTICUT
Regional Utilities Study: Drainage Volume of Technical Appendix.
W73-12368 4A

Regional Utilities Study: Sewerage Volume of Technical Appendix.
W73-12369 5D

A Proposed Streamflow Data Program for Connecticut,
W73-12748 4A

CONSERVATION
Peruvian Fisheries: Conservation and Development.
W73-12689 6B

CONSTRUCTION COSTS
A Pilot Fish-Pond System for Utilization of Sewage Effluents, Humboldt Bay, Northern California,
W73-12434 5D

Construction Costs of Water Supply and Sewage Networks in Poland--1961-1970,
W73-12703 6C

CONSTRUCTION MATERIALS
Galvanic Corrosion of Metals in Cementing Materials,
W73-12775 8G

CONSTRUCTION SITES (DAMS)
Mussels in the Unique Nickajack Dam Construction Site, Tennessee River, 1965,
W73-12800 2I

CONSUMPTIVE USE
Consumptive Use of Water by Dwarf Wheat in Udaipur Valley,
W73-12387 3F

Consumptive Use of Water by Cotton Grown in Transition Tract of Dharwar Under Rainfed Conditions,
W73-12988 3F

CONTAINERSHIPS
Sea-Land Navigation Studies; Hydraulic Model Investigation,
W73-12567 8B

CONTINUOUS FOOTINGS
Bearing Capacity of Footings in Plane Strain,
W73-12484 8D

CONTROL
Nutrient Control in North San Francisco Bay,
W73-12398 5C

CONTROLLED PRESSURE SURGE
Back-Surge Technique Improves Well Completions,
W73-12773 8B

CONVECTION
Convective Ground Water Flow,
W73-12722 2F

CONVERSION SPEED
Boost A/D Rates with Staggered Operation,
W73-12893 7C

CONVERSION SYSTEMS
A Method for High Speed BCD-to-Binary Conversion,
W73-12892 7C

CONVERTIBLE TRAPNETS
Design of Trapnet with Interchangeable Parts for the Capture of Large and Small Fishes from Varying Depths,
W73-12899 8I

COPEPODS
Crustacean Plankton and the Eutrophication of Lakes in the Okanagan Valley, British Columbia,
W73-12624 5C

The Reduction of Copper Toxicity in a Marine Copepod by Sediment Extract,
W73-12909 5C

COPPER
Some Short-Term Indicators of Sublethal Effects of Copper on Brook Trout, Salvelinus Fontinalis,
W73-12859 5C

The Reduction of Copper Toxicity in a Marine Copepod by Sediment Extract,
W73-12909 5C

CORRECTIVE TAXES
Externalities, Welfare, And the Feasibility of Corrective Taxes,
W73-12694 6B

CORRELATION ANALYSIS
The Interrelationships of the Vegetation Characters of Four Salt Desert Shrub Associations of Colorado Plateau,
W73-12791 3B

CORROSION
Corrosion by the Sulphate-Reducing Bacteria,
W73-12756 5G

Comparison of Waterflood Corrosion Detection and Monitoring Devices,
W73-12757 8G

Cathodic Protection for Coated Steel Pipelines,
W73-12765 8G

Corrosion Monitoring Method Reduces Effect of Variables in Analyzing Oil Field Waters,
W73-12767 8G

Corrosion of Metals in Tropical Waters---Structural Ferrous Metals,
W73-12772 8G

Galvanic Corrosion of Metals in Cementing Materials,
W73-12775 8G

Pitless Units and Adapters,
W73-12776 8G

CORROSION CELL
Corrosion by the Sulphate-Reducing Bacteria,
W73-12756 5G

CORROSION TIME CURVE
Corrosion of Metals in Tropical Waters---Structural Ferrous Metals,
W73-12772 8G

COST ALLOCATION
Anti-Pollution Policy and Cost Allocation: The Issues in Practice,
W73-12677 6B

COST ALLOCATION

The Role of Uniform Standards in International Environmental Management.
W73-12686 6B

COST ANALYSIS
Regional Sewer System, Planning and Cost Estimation Model,
W73-12357 5G

Environmental Cost of Mining,
W73-12687 5G

Construction Costs of Water Supply and Sewage Networks in Poland--1961-1970,
W73-12703 6C

Cost Curves for Cross-Drainage Works,
W73-12704 4A

A Study of the Economic Impact on the Steel Industry of the Costs of Meeting Federal Air and Water Pollution Abatement Requirements. Part I - Executive Summary.
W73-12707 5G

Impact of Costs Associated with New Environmental Standards Upon the Petroleum Refining Industry. Part I. The Impact of Environmental Control Costs.
W73-12708 5G

A Descriptive Analysis of the Bakery Products Industry Detailing Industry Trends and Characteristics Relevant to Economic Impact Analysis of Environmental Standards. Part II.
W73-12709 5G

A Study of the Impact of Pollution Standards and Charges on the Bakery Industry. Part III.
W73-12710 5G

COST-BENEFIT ANALYSIS
Environmental Quality Indicators and Social Indicators,
W73-12679 6B

Some Limitations of Benefit-Cost Analysis in Respect of Programmes with Environmental Consequences,
W73-12682 6B

Evaluation of Environmental Intangibles,
W73-12688 6B

Costs and Profitability in the Commercial Fishing Industry: The Insurance Dilemma,
W73-12699 6B

COST TRANSFER
Identification and Achievement of Environmental Quality Levels in Managing the Use of Natural Resources,
W73-12696 5G

COSTS
Antipollution Policies, Their Nature and Their Impact on Corporate Profits,
W73-12695 5G

COTTON
Influence of Certain Rotations Upon Cotton Production in the San Joaquin Valley,
W73-12975 3F

Consumptive Use of Water by Cotton Grown in Transition Tract of Dharwar Under Rainfed Conditions,
W73-12988 3F

CRABS
Biology of Rock Crab (Cancer Irroratus) in Northumberland Strait,
W73-12390 2L

CRATER LAKE
Optical Properties and Color of Lake Tahoe and Crater Lake,
W73-12926 5A

CRAYFISH
The Crayfish, Orconectes Virilis, As an Indicator of Mercury Contamination,
W73-12632 5A

CRITICAL DEPTH
Computer Determination of Critical Depth Control Points in Open Channel Flow,
W73-12483 8B

CRITICAL EROSION VELOCITY
Leaching of Cement from a Concrete Pile Section by Groundwater Flow,
W73-12766 8F

CRITICAL VELOCITY
Computer Determination of Critical Depth Control Points in Open Channel Flow,
W73-12483 8B

CROP PRODUCTION
Methods for Pulp and Paper Mill Sludge Utilization and Disposal,
W73-12519 5E

Annual Water Balance and Agricultural Development in Alaska,
W73-12664 3F

Influence of Certain Rotations Upon Cotton Production in the San Joaquin Valley,
W73-12975 3F

CROTONALDEHYDE
Identification and Control of Petrochemical Pollutants Inhibitory to Anaerobic Processes,
W73-12513 5D

CRUDE OIL
Selective Substrate Utilization by Marine Hydrocarbonoclastic Bacteria,
W73-12621 5B

CRUSTACEANS
Crustacean Plankton and the Eutrophication of Lakes in the Okanagan Valley, British Columbia,
W73-12624 5C

Description and Ecology of Hyaiella Texana N. Sp. (Crustacea: Amphipoda) from the Edwards Plateau of Texas,
W73-12900 2I

Sugar-Coated Daphnia: A Preservation Technique for Cladocera,
W73-12910 5A

CRYSTAL GROWTH
On The Number Distribution of Hail Growing in Updrafts,
W73-12602 2B

CULTURES
Identification of the Limiting Nutrient and Specific Growth Rate,
W73-12861 5C

The Mechanisms of Nitrogen Assimilation in Pseudomonads,
W73-12881 5C

CURRENT METERS
Observations of Intermediate and Small Scale Turbulent Water Motion in a Stratified Estuary (Parts I and II),
W73-12424 2L

Measurement of Currents in the Great Lakes,
W73-12741 2H

CUTTHROAT FLUMES
Generalized Discharge Relations for Cutthroat Flumes,
W73-12474 8B

CYANIDE
Neutralization of Metal Containing Wastes,
W73-12462 5D

CYANOPHYTA
Physiology and Cytological Chemistry of Blue-Green Algae,
W73-12845 5C

CYCLING NUTRIENTS
Aspects of the Biogeochemistry of Carbohydrates and Proteins in Aquatic Environments,
W73-12371 5C

A Mathematical Model of the Nutrient Dynamics of Phytoplankton in a Nitrate-Limited Environment,
W73-12915 5C

CYPRESS (BALD)
Effects of Aeration, Water Supply, and Nitrogen Source on Growth and Development of Tupelo Gum and Bald Cypress,
W73-12923 2I

CYTOLOGICAL STUDIES
Correlated Light and Electron Microscope Studies on Brown Algae. II. Physode Production in Dictyota,
W73-12388 5C

Physiology and Cytological Chemistry of Blue-Green Algae,
W73-12845 5C

Effect of Incubation Temperature on the Macromolecular and Lipid Content of the Phytoflagellate Ochromonas danica,
W73-12896 5C

CZECHOSLOVAKIA
Determination of Organic Substances in Industrial Effluents (Nektere moznosti stanoveni organickeho znecisteni odpadnich vod),
W73-12532 5A

DAM DESIGN
Stresses in the Body and Foundations of Prestressed Dams,
W73-12475 8A

DAM FAILURE
Buffalo Creek Dam Disaster: Why It Happened,
W73-12411 4C

DAM STABILITY
Stresses in the Body and Foundations of Prestressed Dams,
W73-12475 8A

DAMS
Spillway for Oakley Dam, Sangamon River, Illinois-Appendix A: Type 2 (Revised) Spillway,
W73-12582 8A

DAPHNIA
Sugar-Coated Daphnia: A Preservation Technique for Cladocera,
W73-12910 5A

DATA INTERPRETATION
Biological Effects of Artificial Destratification and Aeration in Lakes and Reservoirs-Analysis and Bibliography,
W73-12625 5C

Water Quality Determinations in the Virgin Islands from ERTS-A Data,
W73-12630 5A

DATA PROCESSING
Real-Time Interactive Instrumentation,
W73-12850 7A

Instrumental and Numerical Considerations for On-Line Interpretation of High Resolution Mass Spectral Data,
W73-12874 2K

Optimum Procedure for the Determination of Selenium in Biological Specimens Using Se-77m Neutron Activation,
W73-12876 5A

High Speed A-D Converters in a Memory Test System,
W73-12891 7C

An Approach to Hydrogeologic Investigations of River Alluvium by the Use of Computerized Data Processing Techniques,
W73-12942 2A

DATE TRANSMISSION
High Speed A-D Converters in a Memory Test System,
W73-12891 7C

DDD
DDT in Some New Zealand Marine and Freshwater Fauna,
W73-12925 5A

DDE
Biologically Active Compounds in the Aquatic Environment: The Uptake and Distribution of (1,1-Dichloro-2,2-Bis (P-Chlorophenyl) Ethylene), DDE by Chironomus tentans Fabricius (Diptera: Chironomidae),
W73-12804 5B

DDT in Some New Zealand Marine and Freshwater Fauna,
W73-12925 5A

DDT
PCBs and DDT,
W73-12402 5C

Long-Lived Pollutants in Sediments From the Laguna Atascosa National Wildlife Refuge, Texas,
W73-12595 5B

DDT in Some New Zealand Marine and Freshwater Fauna,
W73-12925 5A

DDT RESIDUES
DDT Residues in White Croakers,
W73-12835 5C

DEBRIS AVALANCES
Catastrophic Rock Slide, Mount Huascaran, North-Central Peru, May 31, 1970,
W73-12409 2J

DECISION MAKING
Heuristic Ranking and Prioritizing Under Subjective Conductions,
W73-12470 6B

New Techniques for Participative Planning in Water Resources,
W73-12472 6B

Water Resource Decison Making--How Effective is the Public Input,
W73-12693 6B

Public Land Use Policy: Needs, Objectives, and Guidelines,
W73-12697 4A

The Development of a Regional Systems Oriented Water Management Model: A Tool for Policy Analysis,
W73-12839 6A

Annual Literature Review: Administration, Systems Analysis,
W73-12840 5G

DECOMPOSING ORGANIC MATTER
The Kinetics of Microbiological Modification of Organic Substances in Natural Waters,
W73-12712 5B

DEFICIENT ELEMENTS
A Study of Inorganic Salts Requirements and Effect on the Morphology of Marine Bacteria,
W73-12628 5C

A Mathematical Model of the Nutrient Dynamics of Phytoplankton in a Nitrate-Limited Environment,
W73-12915 5C

DEGRADATION (DECOMPOSITION)
Energetics of Natural Populations of Freshwater Macroconsumers,
W73-12374 5C

DEGRADATION RATE (HERBICIDES)
The Effect of Adsorbents on the Rate of Degradation of Herbicides Incubated with Soil,
W73-12656 5B

DEHYDRATION
Water Metabolism in Desert Sheep, Effects of Various Degrees of Water Restriction on the Distribution of Body Water in Mariwari Sheep,
W73-12788 3F

DELAWARE
Geohydrology of the Dover Area, Delaware,
W73-12425 7C

Final Environmental Statement: Small Beach Erosion Control Project, Broadkill Beach, Delaware.
W73-12430 8B

Trace Metal Baseline Studies on the Murderkill and St Jones Rivers, Delaware Coastal Plain,
W73-12959 5B

DELAWARE BAY
Biogeochemistry of Sediments of Delaware Bay,
W73-12739 2L

DELAWARE ESTUARY
Delaware Estuary, Pennsylvania, New Jersey, and Delaware, Long-Range Dredged Spoil Disposal Problem.
W73-12560 5E

DELAWARE RIVER
Biogeochemistry of Sediments of Delaware Bay,
W73-12739 2L

DELTAS
Sea Floor Off Magdalena Delta and Santa Marta Area, Colombia,
W73-12591 2J

Computer Models of Delta Growth Due to Sediment Input From Rivers and Longshore Transport,
W73-12592 2J

DEMETHYLATION
Degradation of Methylmercury by Bacteria Isolated from Environmental Samples,
W73-12620 5A

DEMINERALIZATION
Ion Exchange Color and Mineral Removal from Kraft Bleach Wastes,
W73-12522 5D

DEMONSTRATION WATERSHEDS
A Treatment Prescription for Improving Big Game Habitat in Ponderosa Pine Forests,
W73-12406 4D

DENMARK
The Influence of Vegetation on the Redox Profile in the Sediment of Grane Langso, A Danish Lobelia Lake,
W73-12379 5C

DENTAL CARIES
Effect of School Water Fluoridation on Dental Caries: Final Results in Elk Lake, Pa., After 12 years,
W73-12647 5C

DENTAL PRACTICES
Impact of Water Fluoridation on Dental Practice and Dental Manpower,
W73-12816 5F

DENVER (COLO)
Evaluation of Urban Water Management Policies in the Denver Metropolitan Area,
W73-12510 5G

DESALINATION
Ion Exchange Color and Mineral Removal from Kraft Bleach Wastes,
W73-12522 5D

DESALINATION APPARATUS
Heat-Exchanger for Desalting Sea Water,
W73-12453 3A

DESERT PLANTS
The Interrelationships of the Vegetation Characters of Four Salt Desert Shrub Associations of Colorado Plateau,
W73-12791 3B

Welwitschia Mirabilis: Paradox of the Namib Desert,
W73-12796 2I

DESIGN
Design of Trapnet with Interchangeable Parts for the Capture of Large and Small Fishes from Varying Depths,
W73-12899 8I

DESIGN CRITERIA
Graphic Displays for Process Insight,
W73-12617 7B

DETECTION LIMITS
Sensitivity and Detectability Limits for Elemental Analysis by Proton-Induced X-Ray Fluorescence with a 3 Mv Van de Graaff,
W73-12935 5A

DETERGENTS
Process of Treating and Purifying Sewage, Particularly of Sewage Contaminated with Detergents,
W73-12458 5D

Bacterial Degradation of Detergent Compounds,
W73-12938 5B

DETRITIVORES
The Utilization of Leaf Litter by Stream Detritivores,
W73-12882 5C

DETRITUS
Energetics of Natural Populations of Freshwater Macroconsumers,
W73-12374 5C

DETRIVORES
Energetics of Natural Populations of Freshwater Macroconsumers,
W73-12374 5C

DEUTERIUM
Tritium and Deuterium Content of the Snow in Groenland,
W73-12418 5B

DEWATERING
An Efficient Method of Dewatering Effluent Sediments (Effektivnyi Sposob Obezvozhivaniya Osadkov Stochnikh Vod),
W73-12674 5E

DIAMOND DRILL BITS
Diamond-Bit Research Provides Basic Drilling Parameters,
W73-12764 8B

DIATOMS
Studies on the Growth of Phaeodactylum Tricornutum. II. The Effect of Organic Substances on Growth,
W73-12389 5C

Diatom Population Dynamics in a Central Iowa Drainage Ditch,
W73-12665 5C

Some Marine Diatoms from the Galapagos Islands,
W73-12902 2I

DICTOYOTA
Correlated Light and Electron Microscope Studies on Brown Algae. II. Physode Production in Dictyota,
W73-12388 5C

DIESEL FUEL
The Effects of Diesel Fuel on a Stream Fauna,
W73-12997 5C

DIGITAL COMPUTERS
Real-Time Interactive Instrumentation,
W73-12850 7A

DIGITAL TO ANALOG CONVERTERS
Boost A/D Rates with Staggered Operation,
W73-12893 7C

DIGITARIA
Resistance in Digitaria to Yellow Sugarcane Aphid, Siphaflava (Forbes) as Related to Temperature and Rainfall,
W73-12643 2I

DISASTERS
Catastrophic Rock Slide, Mount Huascaran, North-Central Peru, May 31, 1970,
W73-12409 2J

DISCHARGE MEASUREMENT
Prediction of Mixing Lengths for River Flow Gaging,
W73-12414 5B

Generalized Discharge Relations for Cutthroat Flumes,
W73-12474 8B

DISCHARGE (WATER)
Selection of a Suitable System of Effluent Purification (O vybore ratsional'noi sistemy ochistki stochnykh vod),
W73-12673 5D

DISINFECTION
Disinfection of Sewage Effluents,
W73-12504 5D

DISPERSION
The Effect of Longitudinal Dispersion on the Deoxygenation Rate in Polluted Streams,
W73-12714 5B

Delayed Seed Dispersal and Rapid Germination as Survival Mechanisms of the Desert Plant Blepharis Persica (Burm.) Kuntze,
W73-12787 2I

DISPLAY SYSTEMS
Graphic Displays for Process Insight,
W73-12617 7B

DISPOSAL
Disposal of Dredge Spoil; Problem Identification and Assessment and Research Program Development,
W73-12573 4A

Survey of Industrial Waste Injection Wells, Volume II,
W73-12576 5E

DISSOLVED IRON CONTENT
Corrosion Monitoring Method Reduces Effect of Variables in Analyzing Oil Field Waters,
W73-12767 8G

DISSOLVED ORGANIC MATTER
An Improved Method For Determining Organics by Activated Carbon Adsorption and Solvent Extraction - Pt. II (Test Method),
W73-12866 5A

DISSOLVED OXYGEN
Particulate Manganese in Sea Water Stressing Regimes in Marine Anoxic Basins,
W73-12854 5A

Sodium Tungsten Bronze as a Potentiometric Indicating Electrode for Dissolved Oxygen in Aqueous solution,
W73-12873 5A

DISTILLATION
High-Purity Distilled Water Producing Apparatus,
W73-12450 3A

DISTRIBUTION
Investigation of the Environmental Factors Which Affect the Anaerobic Decomposition of Fibrous Sludge Beds on Stream Bottoms,
W73-12936 5B

DISTRIBUTION PATTERNS
The Zooplankton of the Gulf of Guinea,
W73-12623 5A

Particulate Manganese in Sea Water Stressing Regimes in Marine Anoxic Basins,
W73-12854 5A

Community Structure of the Benthos in Scottish Sea-Lochs. II. Spatial Pattern,
W73-12855 5C

DISTRIBUTION PATTERNS (FAUNA)
The Distribution of Stream-Dwelling Triclads (Platyhelminthes) in North Wales,
W73-12971 2I

DISTRICT OF COLUMBIA
Survey of Water Transportation Potential to Reduce Congestion and Pollution in Washington, D.C. and Other Major Cities.
W73-12363 5G

Activated Sludge Treatment with Oxygen,
W73-12586 5D

DOCKS
Effects of Proposed Dock Expansion at Newport News on Tides, Currents, and Shoaling; Hydraulic Model Investigation,
W73-12566 8B

DOCUMENTATION
Biological Effects of Artificial Destratification and Aeration in Lakes and Reservoirs-Analysis and Bibliography,
W73-12625 5C

Biological Effects of Oil Pollution - Selected Bibliography II,
W73-12626 5C

Total Mercury Analysis: Review and Critique,
W73-12885 5A

Analytical Reviews 1973/Applications.
W73-12930 5A

DOMESTIC WASTES
Tertiary Treatment of Combined Domestic and Industrial Wastes,
W73-12512 5D

DON RIVER
Investigation of Thermal Properties of Soils in the Don River Basin for Estimation of Snowmelt Losses to Infiltration Into Frozen Soil (Issledovaniye teplovykh svoystv pochv basseyna r. Dona dlya otsenki poter' talykh vod na in fil'tratsiyu v merzluyu pochvu),
W73-12436 2G

Factors Producing the Outstanding Spring Flood of 1970 in Upper Don River Basins (Usloviya formirovaniya vydayushchegosya vesennego polovod'ya 1970 g. v basseynakh rek verkhnego Dona),
W73-12440 2E

Results of a Study of Water Regime of Soils on Small Watersheds in the Don River Basin (Rezul'taty izucheniya vodnogo rezhima pochv malykh vodosborov v basseyne r. Dona),
W73-12441 2G

Some Hydrophysical Characteristics of Soils in the Don River Basin to Kazanskaya Station (Nekotoryye vodno-fizicheskiye kharakteristiki pochv basseyna r. Dona do st-tsy Kazanskoy),
W73-12443 2G

DOUGLAS-FIR
Average Bowen-Ratio Methods of Calculating Evaportranspiration Applied to a Douglas Fir Forest,
W73-12801 2D

DOVER (DEL)
Geohydrology of the Dover Area, Delaware,
W73-12425 7C

DRAINAGE
Regional Utilities Study: Drainage Volume of Technical Appendix.
W73-12368 4A

DRAINAGE AREA
Hydrologic Models for Poorly Defined Drainage Areas,
W73-12496 2A

DRAINAGE DITCHES
Diatom Population Dynamics in a Central Iowa Drainage Ditch,
W73-12665 5C

DRAINAGE PATTERNS (GEOLOGIC)
A Topologically Optimum River Sampling Plan for South Carolina,
W73-12498 5B

A Suggested New Approach to the Analysis of Drainage Basin Shapes,
W73-12729 4A

Some Examples of Drainage Component Analysis,
W73-12734 4A

A Note on Stream Ordering,
W73-12735 4A

DRAINAGE PROGRAMS
Regional Utilities Study: Drainage Volume of Technical Appendix.
W73-12368 4A

DRAINAGE SYSTEMS
Considerations for Effective Sloping Land Drainage Systems,
W73-12933 4A

DRAINAGE WATER
The Quality of Drainage Water from Irrigated Black Cotton Soils for Irrigation,
W73-12650 3F

DRAINAGE WELLS
Poliovirus in a Water Supply,
W73-12922 5B

DRAWDOWN
Water Levels Near a Well Discharging From an Unconfined Aquifer,
W73-12777 4B

Flow to Wells Near Streams in the Presence of Delayed Yield From Storage and Analysis of Pumping Test Data,
W73-12943 4B

DREDGE SPOIL
Disposal of Dredge Spoil; Problem Identification and Assessment and Research Program Development,
W73-12573 4A

DREDGING
Delaware Estuary, Pennsylvania, New Jersey, and Delaware, Long-Range Dredged Spoil Disposal Problem.
W73-12560 5E

Disposal of Dredge Spoil; Problem Identification and Assessment and Research Program Development,
W73-12573 4A

Maintenance of the Hudson River Channel, New York, Navigation Project, (Final Environmental Statement).
W73-12588 8B

DRIFT
Microdistribution and Density as Factors Affecting the Downstream Drift of Mayflies,
W73-12888 2I

DRIFT (ORGANIC)
The Influence of Organic Drift on the Food Habits and Life History of the Yellowfin Shiner, Notropis Lutipinnis (Jordan and Brayton),
W73-12844 2I

DROUGHT RESISTANCE
Cenchrus Ciliaris--A Perennial Pasture Grass of Arid and Semi-Arid Areas,
W73-12790 4A

DROUGHT TOLERANCE
Water Metabolism in Desert Sheep, Effects of Various Degrees of Water Restriction on the Distribution of Body Water in Mariwari Sheep,
W73-12788 3F

DUCTILITY
High Strength Bolted Galvanized Joints,
W73-12489 8G

DUSTING
Electrostatic Crop Spraying,
W73-12482 3F

E. COLI
ATP Pools in Pure and Mixed Cultures,
W73-12887 5A

EARTH DAMS
Simplified Calculation of Embankment Deformations,
W73-12473 8D

EAST AFRICA FEEDING HABITS (FISH)
The Food and Feeding Habits of the Small Mormyrid Fishes of Lake Victoria, East Africa,
W73-12641 2H

EAST PAKISTAN
Effect of Level of Soil Moisture on Nitrogen Mineralization and Nitrification During Incubation of East Pakistan Tea Soils,
W73-12799 3F

EAST SIBERIA
Hydrochemical Description of the Onon-Argun' Steppe (Gidrokhimicheskaya kharakteristika Onon-Argunskoy stepi),
W73-12746 2K

ECOLOGICAL DISTRIBUTION
Dispersion, Dispersal, and Persistence of the Annual Intertidal Alga, Postelsia Palmeformis Ruprecht,
W73-12883 5C

Ecological Studies of Codium fragile in New England, USA,
W73-12918 5C

ECOLOGY
Mathematical Models in Ecology, Proceedings of the 12th Symposium.
W73-12653 6A

Description and Ecology of Hyaiella Texana N. Sp. (Crustacea: Amphipoda) from the Edwards Plateau of Texas,
W73-12900 2I

Ecological Studies of Codium fragile in New England, USA,
W73-12918 5C

ECONOMETRICS
Evaluation of the Economic Effects of Anti-Pollution Public Policy,
W73-12684 6B

ECONOMIC DEVELOPMENT
Peruvian Fisheries: Conservation and Development.
W73-12689 6B

ECONOMIC EFFICIENCY
Problems of Environmental Economics.
W73-12675 6B

Anti-Pollution Policy and Cost Allocation: The Issues in Practice,
W73-12677 6B

Economics in Soil and Water Conservation,
W73-12691 3F

Externalities, Welfare, And the Feasibility of Corrective Taxes,
W73-12694 6B

ECONOMIC FEASIBILITY
Advanced Pollution Abatement Technology in the Pulp and Paper Industry.
W73-12552 5D

ECONOMIC IMPACT
Economic and Related Impacts of Rural Water Systems in Mississippi,
W73-12493 6B

Evaluation of the Economic Effects of Anti-Pollution Public Policy,
W73-12684 6B

Peruvian Fisheries: Conservation and Development.
W73-12689 6B

Antipollution Policies, Their Nature and Their Impact on Corporate Profits,
W73-12695 5G

A Study of the Economic Impact on the Steel Industry of the Costs of Meeting Federal Air and Water Pollution Abatement Requirements. Part I - Executive Summary.
W73-12707 5G

Impact of Costs Associated with New Environmental Standards Upon the Petroleum Refining Industry. Part I. The Impact of Environmental Control Costs.
W73-12708 5G

A Descriptive Analysis of the Bakery Products Industry Detailing Industry Trends and Characteristics Relevant to Economic Impact Analysis of Environmental Standards. Part II.
W73-12709 5G

A Study of the Impact of Pollution Standards and Charges on the Bakery Industry. Part III.
W73-12710 5G

ECONOMICS
Problems of Environmental Economics.
W73-12675 6B

Extinction of a Fishery by Commercial Exploitation: A Note,
W73-12692 6B

EDAPHIC RELATIONSHIPS
Edaphic and Water Relationships of Aldicarb and its Metabolites,
W73-12979 2G

EDDIES
Outlet Works Stilling Basin for Tallahala Dam, Tallahala Creek, Mississippi; Hydraulic Model Investigation,
W73-12568 8B

EDISTO RIVER (SC)
A Topologically Optimum River Sampling Plan for South Carolina,
W73-12498 5B

EELGRASS
Fouling on Eelgrass (Zostera Marina L.),
W73-12631 5G

EFFICIENCIES
Quantitative Sampling of Live Zooplankton With a Filter-Pump System,
W73-12911 5A

ELASTIC DEFORMATION
Simplified Calculation of Embankment Deformations,
W73-12473 8D

ELECTRICAL WELL LOGGING
Physical Characteristics of Basalt Aquifers,
W73-12523 4B

ELECTRICITY
Electrical Stimulation of Microbial Waste Treatment,
W73-12503 5D

ELECTROCHEMISTRY
Voltammetric Study of the Hydrogen Ion/Hydrogen Couple in Acetonitrile/Water Mixtures,
W73-12872 2K

ELECTRODES
A Simple Method for Recording Fish Heart and Operculum Beats Without the Use of Implanted Electrodes,
W73-12858 7B

ELECTRONIC EQUIPMENT
An Electric Conversion for Mechanical Hydraulic Governors of Water Wheel Turbines,
W73-12469 8C

ELECTROSTATICS
Electrostatic Crop Spraying,
W73-12482 3F

EMBANKMENT
Simplified Calculation of Embankment Deformations,
W73-12473 8D

EMISSION SPECTROSCOPY
Particulate Manganese in Sea Water Stressing Regimes in Marine Anoxic Basins,
W73-12854 5A

EMULSIFIERS
Vessel for the Removal of Oil on Water,
W73-12448 5G

ENERGY
Energy Method for Computing the Amplitude of Vibration of Conductor Bundles Due to Wake Effect,
W73-12480 8C

ENERGY BUDGET
Energetics of Natural Populations of Freshwater Macroconsumers,
W73-12374 5C

ENGINEERING EDUCATION
Encourage Applied Research and Publish the Findings,
W73-12758 5G

ENGINEERING STRUCTURES
Tests of Selected Insulating Materials for Mass Concrete,
W73-12431 8F

ENGLAND
The Growth, Reproduction and Food of the Rosch Rutilus rutilus (L.), of the River Lugg, Herefordshire,
W73-12921 8I

ENGLAND (LYMINGTON ESTUARY)
Bacteria of Muds Colonized by Spartina Townsendii and their Possible Role in Spartina Die-Back,
W73-12705 2L

ENTRANCE VELOCITY
Rational Design of Well Screens,
W73-12771 8B

ENUMERATION
Microbiology in the Aerobic Treatment of Farm Waste,
W73-12890 5D

ENVIRONMENT
Problems of Environmental Economics.
W73-12675 6B

Environmental Policy Issues: Real and Fictitious,
W73-12676 6B

Antipollution Policies, Their Nature and Their Impact on Corporate Profits,
W73-12695 5G

Mathematical Modeling for Environmental Pollution Control,
W73-12711 5G

ENVIRONMENTAL CONTROL
Environmental Impact Study.
W73-12580 5G

Multiple-Use Problems in the Great Lakes.
W73-12960 6B

Toward a Regional Policy for the Great Lakes,
W73-12963 6B

The Planning Viewpoint,
W73-12964 6B

An Industrial Point of View-1970,
W73-12965 6B

ENVIRONMENTAL EFFECTS
Disposal of Dredge Spoil; Problem Identification and Assessment and Research Program Development,
W73-12573 4A

California Power Plant Siting Study: Volumes, I, II, and III.
W73-12574 5G

Environmental Contamination by Toxic Metals,
W73-12605 5B

Biological Effects of Artificial Destratification and Aeration in Lakes and Reservoirs-Analysis and Bibliography,
W73-12625 5C

Environmental Cost of Mining,
W73-12687 5G

Physiological Changes in Mytilus Edulis L. Induced by Temperature and Nutritive Stress,
W73-12878 5C

Artificial Reservoir Destratification Effects on Phytoplankton,
W73-12895 5C

Effect of Incubation Temperature on the Macromolecular and Lipid Content of the Phytoflagellate Ochromonas danica,
W73-12896 5C

Classification of the Coastal Environments of the World: Part II. Africa,
W73-12950 2L

A Symposium on the Preservation and Multiple-Use Problems in the Great Lakes,
W73-12962 5C

ENVIRONMENTAL ENGINEERING
California Power Plant Siting Study: Volumes, I, II, and III.
W73-12574 5G

ENVIRONMENTAL IMPACT STATEMENTS
Final Environmental Statement: Small Beach Erosion Control Project, Broadkill Beach, Delaware.
W73-12430 8B

Maintenance of the Hudson River Channel, New York, Navigation Project, (Final Environmental Statement).
W73-12588 8B

ENVIRONMENTAL POLLUTANTS
Identification and Measurement of Environmental Pollutants. Symposium.
W73-12655 5A

ENVIRONMENTAL POLLUTION
Problems of Environmental Economics.
W73-12675 6B

Environmental Policy Issues: Real and Fictitious,
W73-12676 6B

ENVIRONMENTAL POLLUTION CONTROL
Antipollution Policies, Their Nature and Their Impact on Corporate Profits,
W73-12695 5G

ENVIRONMENTAL QUALITY
Indicators of Environmental Quality. Proceedings of a Symposium.
W73-12654 5G

Identification and Achievement of Environmental Quality Levels in Managing the Use of Natural Resources,
W73-12696 5G

ENVIRONMENTAL QUALITY INDICATORS
Environmental Quality Indicators and Social Indicators,
W73-12679 6B

ENZYMATIC INHIBITORS
An Immobilized Cholinesterase Product for Use in the Rapid Detection of Enzyme Inhibitors in Air or Water,
W73-12901 5A

ENZYME ACTIVITY
An Immobilized Cholinesterase Product for Use in the Rapid Detection of Enzyme Inhibitors in Air or Water,
W73-12901 5A

ENZYMES
The Mechanisms of Nitrogen Assimilation in Pseudomonads,
W73-12881 5C

EQUIPMENT
Selecting Waste Water Aeration Equipment,
W73-12534 5D

Quantitative Sampling of Live Zooplankton With a Filter-Pump System,
W73-12911 5A

EROSION
The Sediments and History of Lake Butte des Morts, Wisconsin,
W73-12355 2J

Glacial Environment and Processes in Southeastern Alaska,
W73-12423 2C

Chena River Lakes Project, Alaska, Problems Relating to Channel Development, Erosion, and Bank and Levee Protection,
W73-12559 8B

Terracettes: A Suggested Classification,
W73-12731 2J

EROSION CONTROL
Final Environmental Statement: Small Beach Erosion Control Project, Broadkill Beach, Delaware.
W73-12430 8B

Stone and Woodchip Mulches for Erosion Control on Construction Sites,
W73-12463 4D

Standards for Soil Erosion and Sediment Control in New Jersey.
W73-12956 2J

EROSION CONTROL GUIDELINES
Standards for Soil Erosion and Sediment Control in New Jersey.
W73-12956 2J

EROSION RATIOS
Erodibility of Hill Soils of Sutlej Catchment Area in Himachal Pradesh,
W73-12635 2J

ERROR SOURCES
Membrane Filter Retention--A Source of Error in the C-14 Method of Measuring Primary Production,
W73-12908 5A

ERTS
Evaluation of ERTS Data for Certain Oceanographic Uses,
W73-12429 7B

ESSENTIAL NUTRIENTS
Identification of the Limiting Nutrient and Specific Growth Rate,
W73-12861 5C

ESTIMATING
Principles for Estimating and Forecasting Water Losses in Spring on Watersheds in Northwestern European USSR (Printsipy otsenki i prognoza poter' vesennikh vod na vodosborakh Severo-Zapada YeTS),
W73-12438 2G

Peter Bohm.
W73-12680 6B

Estimation of Mortality Coefficients from Field Samples of Zooplankton,
W73-12906 5C

ESTUARIES
Characteristic Physical and Biogenic Sedimentary Structures in Georgia Estuaries,
W73-12410 2L

Long Wave Propagation in Idealized Estuary,
W73-12417 2L

Observations of Intermediate and Small Scale Turbulent Water Motion in a Stratified Estuary (Parts I and II),
W73-12424 2L

The Computation of Tides and Currents in Estuaries and Canals,
W73-12428 2L

Grays Harbor Estuary, Washington: Report 2. North Jetty Study,
W73-12581 8B

Heavy Metals in Estuaries and the Coastal Zone,
W73-12606 5B

Lipids in Shallow Bottom Sediments,
W73-12717 5B

Prediction of Unsteady Salinity Intrusion in Estuaries: Mathematical Model and User's Manual,
W73-12728 2L

History of Sedimentation in Montsweag Bay,
W73-12740 2L

Fungi Colonizing Wood Submerged in the Medway Estuary,
W73-12825 2L

Mariculture in Estuarine Oil-Pipeline Canals in Louisiana,
W73-12951 5C

Standing Crops of Natural Fish Populations in Brackish-Water Oil Field Pipeline Canals,
W73-12952 5C

ESTUARINE ENVIRONMENT
Simulation Study of Phytoplankton Photosynthesis and Growth in the Fraser River Estuary,
W73-12919 5C

Mercury Distribution in Estuarine-Nearshore Environment,
W73-12920 5B

ESTUARINE NAVIGATION PROJECTS (USA)
Estuarine Navigation Projects.
W73-12575 8B

EUCALPTUS
The Selection of Eucalpts for Regeneration,
W73-12980 2I

EUCALYPTUS
Frost Resistance in Eucalyptus: A New Method for Assessment of Frost Injury in Altitudinal Provenances of E. Viminalis,
W73-12815 2I

EUCHAETA JAPONICA
The Reduction of Copper Toxicity in a Marine Copepod by Sediment Extract,
W73-12909 5C

EUROPEAN USSR
Water Regime in a Crop Rotation on Chernozem Soils in Southeast Russia (Vodnyy rezhim v sevooborote na chernozemnykh pochvakh Yugo-Vostoka),
W73-12747 2G

EURTOPHICATION
Phosphorus and Eutrophication,
W73-12394 5C

EUTROPHIC LAKES
Benthic Invertebrates in Lake Ashtabula Reservoir, North Dakota,
W73-12863 5C

EUTROPHICATION
Nutrient Enrichment and Eutrophication of Lake Michigan,
W73-12377 5C

Proceedings of Seminar on Eutrophication and Biostimulation.
W73-12391 5C

The Effect of Inorganic Carbon on Eutrophication,
W73-12392 5C

Nitrogen: Recent Studies on the Role of Nitrogen in the Biostimulation and Eutrophication of Aquatic Ecosystems,
W73-12393 5C

Sediment-Water Nutrient Interchange in Eutrophic Lakes,
W73-12395 5C

The Role of Zooplankton in the Process of Eutrophication,
W73-12397 5C

The Shagawa Lake Project: Lake Restoration by Nutrient Removal from Wastewater Effluent,
W73-12520 5D

Crustacean Plankton and the Eutrophication of Lakes in the Okanagan Valley, British Columbia,
W73-12624 5C

EVALUATION
Total Mercury Analysis: Review and Critique,
W73-12885 5A

An Evaluation of Liquid Scintillation Counting Techniques for Use in Aquatic Primary Production Studies,
W73-12907 5A

EVAPORATION
Evaporation During a Flood Period Caused by Spring Snowmelt (Ispareniye v period vesennego snegotayaniya i polovod'ya),
W73-12442 2D

Wind-Driven Model for Evaporite Deposition in a Layered Sea,
W73-12594 2J

EVAPORATION CONTROL
Some Effects of Evaporation Suppression on Reservoir Ecology,
W73-12869 5C

EVAPORITES
Wind-Driven Model for Evaporite Deposition in a Layered Sea,
W73-12594 2J

EVAPOTRANSPIRATION
Average Bowen-Ratio Methods of Calculating Evaportranspiration Applied to a Douglas Fir Forest,
W73-12801 2D

Heat and Water Balance Studies on Grand Cayman,
W73-12822 2D

Water Potential in Red Pine: Soil Moisture, Evapotranspiration, Crown Position,
W73-12837 2I

EXPLOITATION
Extinction of a Fishery by Commercial Exploitation: A Note,
W73-12692 6B

EXTERNALITIES
Notes on Information and Administrative Costs in the Theory of Externalities,
W73-12678 6B

EXUDATION
Characterization of Exudation from Excised Roots of Onion, Allium Cepa: I. Water Flux,
W73-12989 3F

FABRICATION
Design of Trapnet with Interchangeable Parts for the Capture of Large and Small Fishes from Varying Depths,
W73-12899 8I

FARM WASTES
Water Quality Hydrology of Lands Receiving Farm Animal Wastes,
W73-12353 5B

Coordination of Agricultural and Urban Water Quality Management in the Utah Lake Drainage Area,
W73-12508 5G

Demostration of a Waste Disposal System for Livestock Waste,
W73-12517 5D

Microbiology in the Aerobic Treatment of Farm Waste,
W73-12890 5D

FATE OF POLLUTANTS
Degradation of Methylmercury by Bacteria Isolated from Environmental Samples,
W73-12620 5A

Bacterial Degradation of Detergent Compounds,
W73-12938 5B

FAULTS (GEOLOGIC)
Evaluation of Hydraulic Properties of Rock Masses Influenced by Major Heterogeneities,
W73-12468 8E

FAUNA
The Effects of Diesel Fuel on a Stream Fauna,
W73-12997 5C

FEDERAL GOVERNMENT
Report to the Federal Working Group on Pest Management from the Task Group on Categorization of Pesticides Used by the Federal Government.
W73-12598 5G

FEDERAL WATER POLLUTION CONTROL ACT
Effects of Pesticides in Water--A Report to the States.
W73-12752 5G

FEED LOTS
Water Quality Hydrology of Lands Receiving Farm Animal Wastes,
W73-12353 5B

FEEDING HABITS (HERRING)
A Record of Pacific Herring (Clupea harengus Pallasi) Feeding on Juvenile Chinook Salmon (Oncorhynchus tshawytscha) in a British Columbia Estuary,
W73-12375 2L

FERMENTATION
Electrical Stimulation of Microbial Waste Treatment,
W73-12503 5D

FERTILIZATION
A Pilot Fish-Pond System for Utilization of Sewage Effluents, Humboldt Bay, Northern California,
W73-12434 5D

Effects of Fertilization on Aquatic Plants, Water and Bottom Sediments,
W73-12661 5C

Soil Nitrogen Balance in Selected Row-Crop Sites in Southern California,
W73-12670 3F

FERTILIZATIONS
Some Effects of Artificial Fertilization on Enclosed Plankton Populations in Marion Lake, British Columbia,
W73-12384 5C

FERTILIZERS
Nutrients in Nebraska's Waters,
W73-12615 5B

FIBROUS MATERIALS
Wave Damping Effects of Fibrous Screens; Hydraulic Model Investigation,
W73-12564 8B

FIELD CROPS
Hydrophysical Properties and Water Regime of Crimean Southern Chernozems in a Field Crop Rotation (Vodno-fizicheskiye svoystva i vodnyy rezhim yuzhnykh chernozemov Kryma v polevom sevooborote),
W73-12744 2G

FILTER-PUMP SYSTEM *QUANTITATIVE SAMPLING
Quantitative Sampling of Live Zooplankton With a Filter-Pump System,
W73-12911 5A

FILTRATION
Water Decolorization,
W73-12446 5D

Process and Apparatus for Removing Mercury from Waste Water,
W73-12449 5D

Process of Treating and Purifying Sewage, Particularly of Sewage Contaminated with Detergents,
W73-12458 5D

Cross-Flow Filtration Process for Removal of Total Organic Carbon and Phosphates from Aqueous Sewage Effluents,
W73-12460 5D

Neutralization of Metal Containing Wastes,
W73-12462 5D

Methods for the Further Improvement of Spent Liquor Recovery in Lenzing,
W73-12524 5D

FINANCING
Public Support of Private Water Resource Development in Agriculture--With Implications for Firm Growth,
W73-12698 4B

FINITE ELEMENT ANALYSIS
Finite Element Shallow Lake Circulation Analysis,
W73-12413 2H

FINLAND
The Physiognomy and Structure of the Benthic Macrophyte Communities on Rocky Shores in the Southwestern Archipelago of Finland (Seili Islands),
W73-12929 5A

FIRN
Tritium and Deuterium Content of the Snow in Groenland,
W73-12418 5B

FIRS
Estimating Snow-Water Equivalent from Point-Density Measurements of Forest Stands,
W73-12827 4A

FISH
Effect of Heavy Metals on Fish,
W73-12611 5C

Mercury Levels in Wisconsin Fish and Wildlife,
W73-12812 5A

Mercury in Fish: Some Toxicological Considerations,
W73-12826 5C

Mercury in Canadian Fish,
W73-12970 5C

FISH BEHAVIOR
Some Short-Term Indicators of Sublethal Effects of Copper on Brook Trout, Salvelinus Fontinalis,
W73-12859 5C

Swimming Performance of Young Atlantic Salmon (Salmo salar) as Affected by Reduced Ambient Oxygen Concentration,
W73-12897 5C

Behavior of the Goldfish as an Early Warning System for the Presence of Pollutants in Water,
W73-12916 5A

FISH DISEASES
Fish Viruses: Histopathologic Changes Associated with Experimental Channel Catfish Virus Disease,
W73-12382 5C

Handbook of Fish Diseases for Veterinarians and Biologists,
W73-12813 5C

FISH FOOD
The Food and Feeding Habits of the Small Mormyrid Fishes of Lake Victoria, East Africa,
W73-12641 2H

FISH INDUSTRY
Preliminary Study of Sablefish Culture, A Potential New Industry,
W73-12373 8I

FISH MANAGEMENT
Conversion, Maintenance and Assimilation for Walleye, Stizostedion Vitreum Vitreum, as Affected by Size, Diet and Temperature
W73-12832 8I

FISH MEAL
Peruvian Fisheries: Conservation and Development.
W73-12689 6B

FISH MIGRATION
Water Temperature and the Migrations of American Shad,
W73-12666 2I

Fishes of the Big South Fork of the Cumberland River,
W73-12820 4C

FISH MORTAILITY
Aeromonas-Induced Deaths Among Fish and Reptiles in an Eutrophic Inland Lake,
W73-12633 5C

FISH PHYSIOLOGY
A Simple Method for Recording Fish Heart and Operculum Beats Without the Use of Implanted Electrodes,
W73-12858 7B

Mariculture in Estuarine Oil-Pipeline Canals in Louisiana,
W73-12951 5C

Standing Crops of Natural Fish Populations in Brackish-Water Oil Field Pipeline Canals,
W73-12952 5C

FISH POND CONSTRUCTION
A Pilot Fish-Pond System for Utilization of Sewage Effluents, Humboldt Bay, Northern California,
W73-12434 5D

FISH POPULATIONS
Primary Productivity in a New and an Older California Reservoir,
W73-12998 8I

FISH REPRODUCTION
Effects of Metals on Fertilization and Development in Fish,'
W73-12612 5C

FISHERIES
The African Great Lakes Fisheries: Past, Present and Future,
W73-12646 8I

FISHERY
The Lake Chilwa Tilapia and Its Fishery,
W73-12642 2H

FISHES
Fishes of the Yellow Medicine River in Southwestern Minnesota,
W73-12821 2I

FISHING GEAR
Design of Trapnet with Interchangeable Parts for the Capture of Large and Small Fishes from Varying Depths,
W73-12899 8I

FLOCCULATION
Process of Treating and Purifying Sewage, Particularly of Sewage Contaminated with Detergents,
W73-12458 5D

FLOOD DAMAGE
Annual Report of the New York State Urban Development Corporation, 1972.
W73-12356 3D

Flood Insurance for Virginia.
W73-12690 6F

FLOOD FORECASTING
Preliminary Flood-Frequency Relations for Small Streams in Georgia,
W73-12946 4A

FLOOD FREQUENCY
Preliminary Flood-Frequency Relations for Small Streams in Georgia,
W73-12946 4A

FLOOD PEAK
Preliminary Flood-Frequency Relations for Small Streams in Georgia,
W73-12946 4A

FLOOD PROTECTION
Chena River Lakes Project, Alaska, Problems Relating to Channel Development, Erosion, and Bank and Levee Protection,
W73-12559 8B

Flood Insurance for Virginia.
W73-12690 6F

FLOODED SOIL
Nitrogen Loss from Flooded Soil,
W73-12967 2G

FLOODS
Annual Report of the New York State Urban Development Corporation, 1972.
W73-12356 3D

Buffalo Creek Dam Disaster: Why It Happened,
W73-12411 4C

Problems in the Production of a Spring Flood (Voprosy formirovaniya vesennego polovod-'ya).
W73-12435 4A

Estimation and Forecast of Water Losses During a Spring Flood to Groundwater Recharge for Watersheds in Northwestern European USSR Based on Data of the Valday Field Laboratory (Otsenka i prognoz poter' vody v period vesenne go polovod'ya na popolneniye zapasov gruntovykh vod dlya vodosborov Severo-Zapada YeTS (po materialam VNIGL)),
W73-12439 2F

Factors Producing the Outstanding Spring Flood of 1970 in Upper Don River Basins (Usloviya formirovaniya vydayushchegosya vesennego polovod'ya 1970 g. v basseynakh rek verkhnego Dona),
W73-12440 2E

Evaporation During a Flood Period Caused by Spring Snowmelt (Ispareniye v period vesennego snegotayaniya i polovod'ya),
W73-12442 2D

FLORIDA
Rayonier Makes Major Breakthrough in Sulfite Pollution Control.
W73-12542 5D

Aeromonas-Induced Deaths Among Fish and Reptiles in an Eutrophic Inland Lake,
W73-12633 5C

The Design and Operation of Deep-Well Disposal System,
W73-12780 5E

Hydrologic Records for Lake County, Florida: 1971-72,
W73-12949 2E

FLORIDA (ST. JOHNS RIVER)
Investigations on American Shad in the St. Johns River,
W73-12370 2H

FLOTATION
Flotation Machine with Vertically Reciprocating Aerators,
W73-12452 5D

Circular Flotation System,
W73-12457 5D

FLOW CHARACTERISTICS
A Proposed Streamflow Data Program for Connecticut,
W73-12748 4A

Back-Surge Technique Improves Well Completions,
W73-12773 8B

FLOW PROFILES
Computing Backwater at Open Channel Constrictions,
W73-12415 8B

FLOW RATES
Heated Sensors for Flow Measurements,
W73-12618 7B

FLOW RESISTANCE
Effective Hydraulic Roughness for Channels Having Bed Roughness Different from Bank Roughness; A State-Of-The-Art Report,
W73-12565 8B

FLUID-FLOW RATES
Micellar Solutions Stimulate Wells,
W73-12762 8B

FLUID VELOCITY
Diamond-Bit Research Provides Basic Drilling Parameters,
W73-12764 8B

FLUORESCENCE
Laser Induced Fluorescence in Algae: A New Technique for Remote Detection,
W73-12841 5A

FLUORESCENCE SPECTROSCOPY
Polyaromatic Hydrocarbons in High-Boiling Petroleum Distillates. Isolation by Gel Permeation Chromatography and Identification by Fluorescence Spectrometry,
W73-12875 5A

FLUORIDATION
Effect of School Water Fluoridation on Dental Caries: Final Results in Elk Lake, Pa., After 12 years,
W73-12647 5C

Impact of Water Fluoridation on Dental Practice and Dental Manpower,
W73-12816 5F

Fluoridation or Fluoride Supplements: A Statement by the Nutrition Committee, Canadian Paediatric Society.
W73-12990 5G

FLUORIDES
Soluble Silica and Fluoride in Some Surface and Ground Waters of Mysore State,
W73-12969 2K

FLUORINE
Concentration of Fluorine in Potable Water in Bihar Plateau: A Preliminary Survey,
W73-12645 5A

FOOD PROCESSING INDUSTRY
Waste Water Treatment in Commercial Fish Processing: Reducing Stick Water Loadings,
W73-12420 5D

Characterization of Sweet Potato Processing Wastes,
W73-12852 5A

FOOTINGS
Bearing Capacity of Footings in Plane Strain,
W73-12484 8D

FORAGE
Valuation of Timber, Forage and Water from National Forest Lands,
W73-12701 6B

FORAGE GRASSES
Cenchrus Ciliaris--A Perennial Pasture Grass of Arid and Semi-Arid Areas,
W73-12790 4A

FORAGE PALATABILITY
Cenchrus Ciliaris--A Perennial Pasture Grass of Arid and Semi-Arid Areas,
W73-12790 4A

FORECASTING
Principles for Estimating and Forecasting Water Losses in Spring on Watersheds in Northwestern European USSR (Printsipy otsenki i prognoza poter' vesennikh vod na vodosborakh Severo-Zapada YeTS),
W73-12438 2G

Estimation and Forecast of Water Losses During a Spring Flood to Groundwater Recharge for Watersheds in Northwestern European USSR Based on Data of the Valday Field Laboratory (Otsenka i prognoz poter' vody v period vesenne go polovod'ya na popolneniye zapasov gruntovykh vod dlya vodosborov Severo-Zapada YeTS (po materialam VNIGL)),
W73-12439 2F

FOREIGN RESEARCH
Environmental Care at Pulp Mills, Results and Expectations,
W73-12545 5D

FOREST FUELS
Theory of Precipitation Effects on Dead Cylindrical Fuels,
W73-12381 2B

FOREST MANAGEMENT
Measuring Public Responses to Vegetative Management,
W73-12408 4D

FOREST WATERSHEDS
The Benthic Fauna in Four Small Southern Appalachian Streams,
W73-12784 2I

FORESTS
Estimating Snow-Water Equivalent from Point-Density Measurements of Forest Stands,
W73-12827 4A

FORESTS (HIGH ALTITUDE)
High-Altitude Forests and Grasslands of Mt. Albert Edward, New Guinea,
W73-12824 4A

FORMATION-FRACTURE PRESSURES
Sand Control - 3. Chemical Consolidation,
W73-12760 8G

FORT WAYNE (IND)
Phosphorus Removal and Plant Operation Studies at Fort Wayne, Indiana,
W73-12500 5D

FOSSIL PIGMENTS
Stratigraphy of Fossil Pigments as a Guide to the Postglacial History of Kirchner Marsh, Minnesota,
W73-12386 5C

FOULING
Fouling on Eelgrass (Zostera Marina L.),
W73-12631 5G

FOUNDATION BEARING TESTS
Bearing Capacity of Footings in Plane Strain,
W73-12484 8D

FOX RIVER (WIS)
Investigation of the Environmental Factors Which Affect the Anaerobic Decomposition of Fibrous Sludge Beds on Stream Bottoms,
W73-12936 5B

FRACTURE TRACES
New Applications of Geophysical Methods to Ground-Water Problems in Pennsylvania,
W73-12783 2F

FRASER RIVERESTUARY (CANADA)
Simulation Study of Phytoplankton Photosynthesis and Growth in the Fraser River Estuary,
W73-12919 5C

FREDERICK AND HAGERSTOWN VALLEYS (MD)
Hydrogeology of the Carbonate Rocks, Frederick and Hagerstown Valleys, Maryland,
W73-12719 4B

FREEZE CONCENTRATION
Viruses in Metropolitan Waters: Concentration by Polyelectrolytes, Freeze Concentration, and Ultrafiltration,
W73-12867 5F

FRESH WATER ORGANISMS
Aqualculutre: The Farming and Husbandry of Freshwater and Marine Organisms,
W73-12830 3F

FRESHWATER FISH
Degradation of Methylmercury by Bacteria Isolated from Environmental Samples,
W73-12620 5A

Design of Trapnet with Interchangeable Parts for the Capture of Large and Small Fishes from Varying Depths,
W73-12899 8I

FROST INJURY (PLANTS)
Frost Resistance in Eucalyptus: A New Method for Assessment of Frost Injury in Altitudinal Provenances of E. Viminalis,
W73-12815 2I

FROZEN SOILS
Investigation of Thermal Properties of Soils in the Don River Basin for Estimation of Snowmelt Losses to Infiltration Into Frozen Soil (Issledovaniye teplovykh svoystv pochv basseyna r. Dona dlya otsenki poter' talykh vod na in fil'tratsiyu v merzluyu pochvu),
W73-12436 2G

Laboratory Investigations of the Transmission Capacity of Frozen and Thawed Soils Based on Data of the Valday Field Laboratory (Vnigl) (Laboratornyye issledovaniya vodopropusknoy sposobnosti merzlykh i talykh pochvo-gruntov (po materialam merzlothoy laboratorii VNIGL)),
W73-12437 2G

FUNGI
Fungi Colonizing Wood Submerged in the Medway Estuary,
W73-12825 2L

Effect of Soil Moisture on the Growth of Macrophomina Phaseoli, Sclerotium Rolfsii and Fausarium Solani in Soil,
W73-12831 3F

FUNGUS
Influence of Water Potential on Growth, Antibiotic Production and Survival of Cephalosporium gramineum,
W73-12999 5B

GALAPAGOS ISLANDS
Some Marine Diatoms from the Galapagos Islands,
W73-12902 2I

GALVANIC ACTION
Galvanic Corrosion of Metals in Cementing Materials,
W73-12775 8G

GAS BUBBLES
Wastewater Treatment System,
W73-12455 5D

GAS CHROMATOGRAPHY
Insecticide Residues in Water and Sediment from Cisterns on the U.S. and British Virgin Islands - 1970,
W73-12894 5B

DDT in Some New Zealand Marine and Freshwater Fauna,
W73-12925 5A

GAS PRODUCTION
Gas Production in Sediments of Lake Mendota, Wisconsin,
W73-12378 5C

GASTINEAU CHANNEL (ALAS)
Navigation Channel Improvement, Gastineau Channel, Alaska; Hydraulic Model Investigation,
W73-12571 8A

GEIGER-MULLER ESTIMATES
A Comparison of Liquid Scintillation and Geiger-Muller Estimates of Primary Productivity in an in Situ Experiment,
W73-12848 5A

GEL PERMEATION CHROMATOGRAPHY
Polyaromatic Hydrocarbons in High-Boiling Petroleum Distillates. Isolation by Gel Permeation Chromatography and Identification by Fluorescence Spectrometry,
W73-12875 5A

GEOCHEMISTRY
Aspects of the Biogeochemistry of Carbohydrates and Proteins in Aquatic Environments,
W73-12371 5C

Biogeochemistry of Sediments of Delaware Bay,
W73-12739 2L

Silica In Thermal and Cold Waters (Kremnezem v termal'nykh i kholodnykh vodakh),
W73-12751 2K

GEOLOGIC HISTORY
Stratigraphy of Fossil Pigments as a Guide to the Postglacial History of Kirchner Marsh, Minnesota,
W73-12386 5C

GEOLOGY
Geology of Nelson and Walsh Counties, North Dakota,
W73-12579 2F

GEOMORPHOLOGY
Process-Form Variability of Multiclass Coasts: Baja California,
W73-12422 2L

Glacial Environment and Processes in Southeastern Alaska,
W73-12423 2C

Classification of Coastal Environments, Procedures and Guidelines,
W73-12433 2L

Forecasting Storm-Induced Beach Changes Along Virginia's Ocean Coast,
W73-12584 4A

River Channel Change With Time: An Example,
W73-12590 2J

Horton's 1945 Study: A Cartobibliography,
W73-12596 7C

A Suggested New Approach to the Analysis of Drainage Basin Shapes,
W73-12729 4A

Terracettes: A Suggested Classification,
W73-12731 2J

Some Examples of Drainage Component Analysis,
W73-12734 4A

A Note on Stream Ordering,
W73-12735 4A

The Superimposition Hypothesis for Incised Meanders--A General Rejecton and Specific Test,
W73-12736 2E

Climatic Change and Arrested Meander Development on the River Severn,
W73-12737 4A

GEORGIA
Preimpoundment Study of West Point Lake, Georgia,
W73-12376 5C

Characteristic Physical and Biogenic Sedimentary Structures in Georgia Estuaries,
W73-12410 2L

Preliminary Flood-Frequency Relations for Small Streams in Georgia,
W73-12946 4A

GEOTHERMAL STUDIES
Sources of Data for Evaluation of Selected Geothermal Areas in Northern and Central Nevada,
W73-12947 4B

GERMANY
Investigations on Waste Water Clarification with Activated Carbon (Untersuchungen zur Restabwasserklarung mit Aktivkohle),
W73-12543 5D

Artificial Recharge of Groundwater and Infiltration Basins (Iskusstvennoye vospolneniye zapasov i infil'tratsionnyye vodozabory podzemnykh vod),
W73-12745 4B

GERMINATION
Delayed Seed Dispersal and Rapid Germination as Survival Mechanisms of the Desert Plant Blepharis Persica (Burm.) Kuntze,
W73-12787 2I

GLACIAL DRIFT
The Sediments and History of Lake Butte des Morts, Wisconsin,
W73-12355 2J

GLACIATION
Glacial Environment and Processes in Southeastern Alaska,
W73-12423 2C

GOLDFISH
Behavior of the Goldfish as an Early Warning System for the Presence of Pollutants in Water,
W73-12916 5A

GOVERNORS
An Electric Conversion for Mechanical Hydraulic Governors of Water Wheel Turbines,
W73-12469 8C

GRAND CAYMAN ISLAND (B.W.I.)
Heat and Water Balance Studies on Grand Cayman,
W73-12822 2D

GRANE LANGSO (DENMARK)
The Influence of Vegetation on the Redox Profile in the Sediment of Grane Langso, A Danish Lobelia Lake,
W73-12379 5C

GRAPHICAL ANALYSIS
Note on Charges and Bribes in the Long Run within Watersheds,
W73-12702 5G

GRASSES
Growth and Chemical Composition of Eight Grasses Grown Under High Water Table Conditions,
W73-12972 2I

GRASSLANDS
Hydrochemical Description of the Onon-Argun' Steppe (Gidrokhimicheskaya kharakteristika Onon-Argunskoy stepi),
W73-12746 2K

High-Altitude Forests and Grasslands of Mt. Albert Edward, New Guinea,
W73-12824 4A

GRAYS HARBOR ESTUARY (WASH)
Grays Harbor Estuary, Washington: Report 2. North Jetty Study,
W73-12581 8B

GRAZING
The Role of Zooplankton in the Process of Eutrophication,
W73-12397 5C

Terracettes: A Suggested Classification,
W73-12731 2J

GREAT LAKES
Measurement of Currents in the Great Lakes,
W73-12741 2H

Multiple-Use Problems in the Great Lakes.
W73-12960 6B

Our Environmental Equilibrium in Nature,
W73-12961 6B

A Symposium on the Preservation and Multiple-Use Problems in the Great Lakes,
W73-12962 5C

Toward a Regional Policy for the Great Lakes,
W73-12963 6B

The Planning Viewpoint,
W73-12964 6B

An Industrial Point of View-1970,
W73-12965 6B

GREEN BAY (WIS)
Joint Treatment of Pulp Mill Effluents and Municipal Sewage.
W73-12528 5D

GREENLAND
Tritium and Deuterium Content of the Snow in Groenland,
W73-12418 5B

GREENVILLE COUNTY (S.C.)
Determination of Public Environmental Preferences in Water Resources Planning and Development,
W73-12706 6B

GROSS ATTITUDE CHANGE
Measuring and Developing Methods of Attitude and Motivational Change in Implementing the Big Blue River Basin Water Plan,
W73-12491 6B

GROSS NATIONAL PRODUCT
Environmental Policy Issues: Real and Fictitious,
W73-12676 6B

GROUND TRUTH
An Interdisciplinary Study of the Estuarine and Coastal Oceanography of Block Island Sound and Adjacent New York Coastal Waters,
W73-12629 5A

GROUNDWATER
Hydrological Year-Book of Israel, 1970/71.
W73-12432 2A

Ground Water Pollution in the South Central States,
W73-12515 5B

Geology of Nelson and Walsh Counties, North Dakota,
W73-12579 2F

Artificial Recharge of Groundwater and Infiltration Basins (Iskusstvennoye vospolneniye zapasov i infil'tratsionnyye vodozabory podzemnykh vod),
W73-12745 4B

Silica In Thermal and Cold Waters (Kremnezem v termal'nykh i kholodnykh vodakh),
W73-12751 2K

Hydrologic Records for Lake County, Florida: 1971-72,
W73-12949 2E

GROUNDWATER BASINS
Presidio Bolson, Trans-Pecos Texas and Adjacent Mexico: Geology of a Desert Basin Aquifer System,
W73-12585 2F

GROUNDWATER MOVEMENT
Analysis of Seepage Into Ground-Water System,
W73-12412 4B

Environmental Isotopes and Circulation in Aquifers Under Venice (Isotopes du Milieu et Circulations dans les Aquiferes du Sous-Sol Venitien),
W73-12419 2F

Physical Characteristics of Basalt Aquifers,
W73-12523 4B

Convective Ground Water Flow,
W73-12722 2F

Ground Water Models With Parallel Linear Reservoirs,
W73-12723 2F

Leaching of Cement from a Concrete Pile Section by Groundwater Flow,
W73-12766 8F

Salt Pollution of a Shallow Aquifer--Indianapolis, Indiana,
W73-12940 5B

Flow to Wells Near Streams in the Presence of Delayed Yield From Storage and Analysis of Pumping Test Data,
W73-12943 4B

GROUNDWATER POLLUTION
An Investigation of the Nitrate Problem in Runnels County, Texas,
W73-12514 5B

GROUNDWATER RECHARGE
Estimation and Forecast of Water Losses During a Spring Flood to Groundwater Recharge for Watersheds in Northwestern European USSR Based on Data of the Valday Field Laboratory (Otsenka i prognoz poter' vody v period veseane go polovod'ya na popolneniye zapasov gruntovykh vod dlya vodosborov Severo-Zapada YeTS (po materialam VNIGL)),
W73-12439 2F

Artificial Recharge of Groundwater and Infiltration Basins (Iskusstvennoye vospolneniye zapasov i infil'tratsionnyye vodozabory podzemnykh vod),
W73-12745 4B

GROUNDWATER RESOURCES
Geohydrology of the Dover Area, Delaware,
W73-12425 7C

Ground-Water Resources, Nelson and Walsh Counties, North Dakota,
W73-12578 2F

Evaluation of the Water Resources of Lemmon Valley, Washoe County, Nevada, With Emphasis on Effects of Ground-Water Development to 1971,
W73-12718 4B

Hydrogeology of the Carbonate Rocks, Frederick and Hagerstown Valleys, Maryland,
W73-12719 4B

Evaluation of a Shallow Leaky Water Table Aquifer in a Subhumid Region of France,
W73-12941 2F

GROUTING
Sand Control - 3. Chemical Consolidation,
W73-12760 8G

Guide Specification for Chemical Grouts.
W73-12782 8G

GROWTH KINETICS
Phytoplankton Algae: Nutrient Concentrations and Growth,
W73-12924 5C

GROWTH RATES
Identification of the Limiting Nutrient and Specific Growth Rate,
W73-12861 5C

Phytoplankton Algae: Nutrient Concentrations and Growth,
W73-12924 5C

GROWTH STAGES
The Reduction of Copper Toxicity in a Marine Copepod by Sediment Extract,
W73-12909 5C

GUARANTEES
Turbine Design and Performance for the Mersey-Forth Hydro Power Development,
W73-12486 8C

GULF OF AQABA
Trace Element Trapping in Pteropod Tests,
W73-12937 5B

GULF OF CALIFORNIA
Process-Form Variability of Multiclass Coasts: Baja California,
W73-12422 2L

GUM (TUPELO)
Effects of Aeration, Water Supply, and Nitrogen Source on Growth and Development of Tupelo Gum and Bald Cypress,
W73-12923 2I

GYPSUM
Leaching Salty Soils,
W73-12789 2G

HABITAT IMPROVEMENT
Wildlife Habitat Improvement in Relation to Watershed Management in the Southwest,
W73-12404 4D

Responses od Deer and Elk to Beaver Creek Watershed Treatments,
W73-12405 4D

A Treatment Prescription for Improving Big Game Habitat in Ponderosa Pine Forests,
W73-12406 4D

HAIL
On The Number Distribution of Hail Growing in Updrafts,
W73-12602 2B

HALOPHYTES
Sodium Relations in Desert Plants: 1. Cation Contents of Some Plant Species from the Mojave and Great Basin Deserts,
W73-12792 2I

HAPLOCHROMIS
Exploratory Bottom Trawling in Lake Victoria,
W73-12803 2H

HARBORS
An Evaluation of Baltimore Harbor Land Use Potentials,
W73-12361 6B

Shoaling Conditions, St. Louis Harbor, Mississippi River; Hydraulic Model Investigation,
W73-12570 8B

HAWAII
Tritium Measurement of Natural Waters on Oahu, Hawaii: A Preliminary Interpretation (Sampling Period: July 1969 to June 1970),
W73-12499 5A

Climatology of Rainfall Probabilities for Oahu, Hawaii,
W73-12587 2B

HAZARDOUS MATERIAL SPILLS
Control of Oil and Other Hazardous Materials.
W73-12427 5G

HEART RATE
A Simple Method for Recording Fish Heart and Operculum Beats Without the Use of Implanted Electrodes,
W73-12858 7B

HEAT EXCHANGERS
Heat-Exchanger for Desalting Sea Water,
W73-12453 3A

HEATED WATER
Numerical Thermal Plume Model for Vertical Outfalls in Shallow Water,
W73-12506 5B

HEATING SOIL
Significance of Heating Agricultural Soils,
W73-12802 3F

HEAVY METALS
Heavy Metals in the Environment.
W73-12604 5B

Environmental Contamination by Toxic Metals,
W73-12605 5B

Heavy Metals in Estuaries and the Coastal Zone,
W73-12606 5B

Arsenic and Cadmium in the Environment,
W73-12607 5C

Transport of Heavy Metals Through the Air Environment,
W73-12609 5B

Health Standards for Metals in Drinking Water,
W73-12610 5G

Effect of Heavy Metals on Fish,
W73-12611 5C

Effects of Metals on Fertilization and Development in Fish,
W73-12612 5C

The Role of Heavy Metals in Biology,
W73-12613 5C

Selenium in the Environment,
W73-12614 5C

Stream-Velocity Effects on the Heavy-Metal Concentrations,
W73-12870 5B

Chemistry and Trophic Status of Seven New Zealand Lakes,
W73-12928 5C

Sensitivity and Detectability Limits for Elemental Analysis by Proton-Induced X-Ray Fluorescence with a 3 Mv Van de Graaff,
W73-12935 5A

HELMINTHS
Studies on Helminths of North Dakota: IV. Parasites of the River Carpsucker, Carpiodes carpio, with Descriptions of Three New Species (Monogenea),
W73-12984 2I

HERBICIDE RUNOFF
Herbicide Contamination of Surface Runoff Waters,
W73-12511 5B

HERBICIDES
Herbicide Contamination of Surface Runoff Waters,
W73-12511 5B

The Effect of Adsorbents on the Rate of Degradation of Herbicides Incubated with Soil,
W73-12656 5B

Evaluation of Herbicides for Submerged Weeds in Chambal and Bhakra-Nangal Canal Systems,
W73-12738 5G

Auger Soil Sampler for Herbicide Residues,
W73-12794 2G

Simultaneous Detection of the Residues of Atrazine and Linuron in Water, Soil, Plant, and Animal Samples by Thin-layer Chromatography,
W73-12811 5A

HETEROGENEITY
Evaluation of Hydraulic Properties of Rock Masses Influenced by Major Heterogeneities,
W73-12468 8E

HETEROTROPHIC BACTERIA
A Relationship between Heterotrophic Utilization of Organic Acids and Bacterial Populations in West Blue Lake, Manitoba,
W73-12903 5C

HETEROTROPHIC MICROORGANISMS
Microbiology in the Aerobic Treatment of Farm Waste,
W73-12890 5D

HETEROTROPHIC NUTRITION
The Utilization of Leaf Litter by Stream Detritivores,
W73-12882 5C

A Relationship between Heterotrophic Utilization of Organic Acids and Bacterial Populations in West Blue Lake, Manitoba,
W73-12903 5C

HEXADECANOL
Some Effects of Evaporation Suppression on Reservoir Ecology,
W73-12869 5C

HIGH STRENGTH BOLTS
High Strength Bolted Galvanized Joints,
W73-12489 8G

HIGH STRENGTH STEELS
Welding of a Normalized High Strength Low Alloy Plate Steel of Structural Quality,
W73-12466 8G

HOISTING MACHINERY
Large Hydraulic Gates and Valves in the Snowy Mountain Scheme--A Review of Practice,
W73-12476 8C

HORIZONTAL DISPLACEMENTS
Simplified Calculation of Embankment Deformations,
W73-12473 8D

HORTONS LAW
Horton's 1945 Study: A Cartobibliography,
W73-12596 7C

Some Examples of Drainage Component Analysis,
W73-12734 4A

A Note on Stream Ordering,
W73-12735 4A

HOT FILM SENSORS
Heated Sensors for Flow Measurements,
W73-12618 7B

HOT WIRE SENSORS
Heated Sensors for Flow Measurements,
W73-12618 7B

HUDSON RIVER
Maintenance of the Hudson River Channel, New York, Navigation Project, (Final Environmental Statement).
W73-12588 8B

HUDSON RIVER CHANNEL
Maintenance of the Hudson River Channel, New York, Navigation Project, (Final Environmental Statement).
W73-12588 8B

HUMAN PATHOLOGY
Arsenic and Cadmium in the Environment,
W73-12607 5C

The Role of Heavy Metals in Biology,
W73-12613 5C

Selenium in the Environment,
W73-12614 5C

HUMAN WASTES
Reuse of Human Wastes in Agriculture,
W73-12817 5D

HURRICANE AGNES
Annual Report of the New York State Urban Development Corporation, 1972.
W73-12356 3D

HYALELLA TEXANA
Description and Ecology of Hyaiella Texana N. Sp. (Crustacea: Amphipoda) from the Edwards Plateau of Texas,
W73-12900 2I

HYDRASIEVE
Demostration of a Waste Disposal System for Livestock Waste,
W73-12517 5D

HYDRAULIC CONDUCTIVITY
Nomograph for Hydraulic Conductivity and Intrinsic Permeability of Water-Soil System,
W73-12808 2G

Germination of Wheat as Affected by Soil Water Stress,
W73-12884 3F

HYDRAULIC ENGINEERING
Estuarine Navigation Projects.
W73-12575 8B

HYDRAULIC-FRACTURING
Sand Control - 3. Chemical Consolidation,
W73-12760 8G

HYDRAULIC GATES
Large Hydraulic Gates and Valves in the Snowy Mountain Scheme--A Review of Practice,
W73-12476 8C

HYDRAULIC LIFT
Diamond-Bit Research Provides Basic Drilling Parameters,
W73-12764 8B

HYDRAULIC MODELS
Reflection Characteristics of Screen Wave Absorbers; Hydraulic Model Investigation,
W73-12561 8B

Wave Transmission Through Rock Structures; Hydraulic Model Investigation,
W73-12563 8B

Wave Damping Effects of Fibrous Screens; Hydraulic Model Investigation,
W73-12564 8B

Effects of Proposed Dock Expansion at Newport News on Tides, Currents, and Shoaling; Hydraulic Model Investigation,
W73-12566 8B

Sea-Land Navigation Studies; Hydraulic Model Investigation,
W73-12567 8B

Outlet Works Stilling Basin for Tallahala Dam, Tallahala Creek, Mississippi; Hydraulic Model Investigation,
W73-12568 8B

Selective Withdrawal from Man-Made Lakes, Hydraulic Laboratory Ivestigation,
W73-12569 4A

HYDRAULIC MODELS

Shoaling Conditions, St. Louis Harbor, Mississippi River; Hydraulic Model Investigation,
W73-12570 8B

Navigation Channel Improvement, Gastineau Channel, Alaska; Hydraulic Model Investigation,
W73-12571 8A

Effects of Submerged Sills in the St. Clair River; Hydraulic Model Investigation,
W73-12572 8B

HYDRAULIC PROPERTIES

Evaluation of Hydraulic Properties of Rock Masses Influenced by Major Heterogeneities,
W73-12468 8E

HYDRAULIC TURBINES

An Electric Conversion for Mechanical Hydraulic Governors of Water Wheel Turbines,
W73-12469 8C

Turbine Design and Performance for the Mersey-Forth Hydro Power Development,
W73-12486 8C

HYDRAULIC VALVES

Large Hydraulic Gates and Valves in the Snowy Mountain Scheme--A Review of Practice,
W73-12476 8C

HYDRAULICS

Computer Determination of Critical Depth Control Points in Open Channel Flow,
W73-12483 8B

Simplified Solution for Decreasing Flow in Wells,
W73-12759 8B

Rational Design of Well Screens,
W73-12771 8B

HYDRO CARBONS

Photosulfoxidation of Hydrocarbons in the Liquid Phase,
W73-12833 2K

HYDROGEN ION CONCENTRATION

Neutralization of Metal Containing Wastes,
W73-12462 5D

Disinfection of Sewage Effluents,
W73-12504 5D

HYDROGEN SULFIDE

Particulate Manganese in Sea Water Stressing Regimes in Marine Anoxic Basins,
W73-12854 5A

HYDROGEOLOGY

Geohydrology of the Dover Area, Delaware,
W73-12425 7C

Presidio Bolson, Trans-Pecos Texas and Adjacent Mexico: Geology of a Desert Basin Aquifer System,
W73-12585 2F

Ground Water Models With Parallel Linear Reservoirs,
W73-12723 2F

Evaluation of a Shallow Leaky Water Table Aquifer in a Subhumid Region of France,
W73-12941 2F

An Approach to Hydrogeologic Investigations of River Alluvium by the Use of Computerized Data Processing Techniques,
W73-12942 2A

Hydraulics of Sheetlike Solution Cavities,
W73-12944 4B

HYDROGRAPH ANALYSIS

Hydrological Reservoir Design Using Basic Systems Theory Techniques,
W73-12471 8A

HYDROLOGIC ASPECTS

The Computation of Tides and Currents in Estuaries and Canals,
W73-12428 2L

HYDROLOGIC DATA

Hydrological Year-Book of Israel, 1970/71.
W73-12432 2A

Hydrologic Records for Lake County, Florida: 1971-72,
W73-12949 2E

HYDROLOGIC PROPERTIES

Some Hydrophysical Characteristics of Soils in the Don River Basin to Kazanskaya Station (Nekotoryye vodno-fizicheskiye kharakteristiki pochv basseyna r. Dona do st-tsy Kazanskoy),
W73-12443 2G

Hydrophysical Properties and Water Regime of Crimean Southern Chernozems in a Field Crop Rotation (Vodno-fizicheskiye svoystva i vodnyy rezhim yuzhnykh chernozemov Kryma v polevom sevooborote),
W73-12744 2G

HYDROLOGIC SYSTEMS

Hydrological Year-Book of Israel, 1970/71.
W73-12432 2A

HYDROSTATIC PRESSURE

Extreme Water Stress and Photosynthetic Activity of the Desert Plant Artemisia Herba-Alba Asso,
W73-12785 2I

Hydrostatic Pressure in Relation to the Synchronous Culture of Algae in Open and Closed Systems,
W73-12798 5C

HYDROXYLATION

Aromatic Hydroxylation as an Analytical Reaction,
W73-12853 5A

HYRUM RESERVOIR (UTAH)

Sediment-Water Nutrient Interchange in Eutrophic Lakes,
W73-12395 5C

ICE COVER

Lake Movements with Partial Ice Cover,
W73-12663 2H

ICTALURUS-PUNCTATUS

Rearing Channel Catfish Fingerlings Under Intensive Culture Conditions,
W73-12488 8I

IDAHO

Effects of Zectran Insecticide on Aquatic Organisms in Bear Valley Creek, Idaho,
W73-12634 5C

Stage-Discharge Relations on Big Lost River Within National Reactor Testing Station, Idaho,
W73-12750 4A

ILLINOIS

The Lakefront Plan of Chicago.
W73-12367 4C

Control of Mine Drainage from Coal Mine Mineral Wastes - Phase II - Pollution Abatement and Monitoring,
W73-12516 5G

Spillway for Oakley Dam, Sangamon River, Illinois-Appendix A: Type 2 (Revised) Spillway,
W73-12582 8A

Lithium Silicate Sedimentation Tracer for Shoal Deposit Studies,
W73-12862 5B

IMPERIAL VALLEY (CALIF.)

Field Leaching by Sprinkler and Surface Irrigation During a Crop Season,
W73-12464 3F

IMPOUNDMENTS

Mathematical Simulation of the Turbidity Structure within an Impoundment; Hydraulic Laboratory Investigation,
W73-12562 8B

INCINERATION

Methods for Pulp and Paper Mill Sludge Utilization and Disposal,
W73-12519 5E

INDEXING

Water Pollution Potential of Manufactured Products--Catalog Section I,
W73-12671-1 5G

Water Pollution Potential of Manufactured Products--Catalog Section II, Product Listing,
W73-12671-2 5G

Water Pollution Potential of Manufactured Products--Catalog Section III, Chemical Ingredient Listing,
W73-12671-3 5G

INDIA

Erodibility of Hill Soils of Sutlej Catchment Area in Himachal Pradesh,
W73-12635 2J

Botany Along Sonamarg to Trunkhal,
W73-12657 2I

Influence of Moisture Regime on the Genesis of Laterite Soils in South Inida: II. Clay Composition and Mineralogy,
W73-12721 2G

Evaluation of Herbicides for Submerged Weeds in Chambal and Bhakra-Nangal Canal Systems,
W73-12738 5G

INDIA (BIHAR)

Effect of Quality of Well Waters on the Germination and Mineral Composition of Wheat on Saline-Sodic Soils Rich in Magnesium,
W73-12809 3C

INDIA (BIHAR PLATEAU)

Concentration of Fluorine in Potable Water in Bihar Plateau: A Preliminary Survey,
W73-12645 5A

INDIA (DHARWAR)
Consumptive Use of Water by Cotton Grown in Transition Tract of Dharwar Under Rainfed Conditions,
W73-12988 3F

INDIA (HARYANA-PUNJAB-PRADESH)
Leaching Salty Soils,
W73-12789 2G

INDIA (MAHARASHTRA)
Cost Curves for Cross-Drainage Works,
W73-12704 4A

INDIA (MYSORE)
Soluble Silica and Fluoride in Some Surface and Ground Waters of Mysore State,
W73-12969 2K

INDIA (RAJASTHAN)
Water Metabolism in Desert Sheep, Effects of Various Degrees of Water Restriction on the Distribution of Body Water in Mariwari Sheep,
W73-12788 3F

INDIA (SHOLAPUR)
Variability of Rainfall and Agricultural Efficiency of Sholapur District,
W73-12659 3F

INDIANA
Phosphorus Removal and Plant Operation Studies at Fort Wayne, Indiana,
W73-12500 5D

INDIANAPOLIS
Salt Pollution of a Shallow Aquifer--Indianapolis, Indiana,
W73-12940 5B

INDICATORS
The Crayfish, Orconectes Virilis, As an Indicator of Mercury Contamination,
W73-12632 5A

Indicators of Environmental Quality. Proceedings of a Symposium.
W73-12654 5G

Environmental Quality Indicators and Social Indicators,
W73-12679 6B

Sodium Tungsten Bronze as a Potentiometric Indicating Electrode for Dissolved Oxygen in Aqueous solution,
W73-12873 5A

INDOPHENOL BLUE METHOD
Spectrophotometric Determination of Ammonia,
W73-12886 5A

INDUCED INFILTRATION
Artificial Recharge of Groundwater and Infiltration Basins (Iskusstvennoye vospolneniye zapasov i infil'tratsionnyye vodozabory podzemnykh vod),
W73-12745 4B

INDUSTRIAL PRODUCTION
Water Pollution Potential of Manufactured Products--Catalog Section I,
W73-12671-1 5G

Water Pollution Potential of Manufactured Products--Catalog Section II, Product Listing,
W73-12671-2 5G

Water Pollution Potential of Manufactured Products--Catalog Section III, Chemical Ingredient Listing,
W73-12671-3 5G

INDUSTRIAL WASTES
Water Decolorization,
W73-12446 5D

Process and Apparatus for Removing Mercury from Waste Water,
W73-12449 5D

Activated Sludge Plant,
W73-12451 5D

Flotation Machine with Vertically Reciprocating Aerators,
W73-12452 5D

Wastewater Treatment System,
W73-12455 5D

Neutralization of Metal Containing Wastes,
W73-12462 5D

Tertiary Treatment of Combined Domestic and Industrial Wastes,
W73-12512 5D

Identification and Control of Petrochemical Pollutants Inhibitory to Anaerobic Processes,
W73-12513 5D

Optimum Conditions for the Discharge of Paper Industry Effluents (Optimal'noe vodootvedenie stokov bumazhnogo proizvodstva),
W73-12547 5G

Water Pollution Potential of Manufactured Products--Catalog Section I,
W73-12671-1 5G

Water Pollution Potential of Manufactured Products--Catalog Section II, Product Listing,
W73-12671-2 5G

Water Pollution Potential of Manufactured Products--Catalog Section III, Chemical Ingredient Listing,
W73-12671-3 5G

Characterization of Sweet Potato Processing Wastes,
W73-12852 5A

The Use of Fish as Sensors in Industrial Waste Lines to Prevent Fish Kills,
W73-12889 5C

A Symposium on the Preservation and Multiple-Use Problems in the Great Lakes,
W73-12962 5C

INDUSTRIAL WATER
Possibilities of Water Treatment by Means of a Magnetic Field,
W73-12481 5D

INFILTRATION
Investigation of Thermal Properties of Soils in the Don River Basin for Estimation of Snowmelt Losses to Infiltration Into Frozen Soil (Issledovaniye teplovykh svoystv pochv basseyna r. Dona dlya otsenki poter' talykh vod na in fil'tratsiyu v merzluyu pochvu),
W73-12436 2G

Laboratory Investigations of the Transmission Capacity of Frozen and Thawed Soils Based on Data of the Valday Field Laboratory (Vnigl) (Laboratornyye issledovaniya vodopropusknoy sposobnosti merzlykh i talykh pochvo-gruntov (po materialam merzlothoy laboratorii VNIGL)),
W73-12437 2G

Improvements in Moving Sprinkler Irrigation Systems for Conservation of Water,
W73-12507 3F

Factors Affecting the Percolation Test,
W73-12716 5B

INFILTRATION BASINS
Artificial Recharge of Groundwater and Infiltration Basins (Iskusstvennoye vospolneniye zapasov i infil'tratsionnyye vodozabory podzemnykh vod),
W73-12745 4B

INFILTROMETERS
Improvements in Moving Sprinkler Irrigation Systems for Conservation of Water,
W73-12507 3F

INFORMATION RETRIEVAL
Sources of Data for Evaluation of Selected Geothermal Areas in Northern and Central Nevada,
W73-12947 4B

INFRARED PHOTOGRAPHY
An Investigation of the Nitrate Problem in Runnels County, Texas,
W73-12514 5B

INFRARED SPECTROPHOTOMETRY
Determination of Alkylbenzenesulfonate (ABS) in Bottom Sediment,
W73-12932 5A

INJECTION HORIZON
Waste Disposal Well Performance,
W73-12779 5E

INJECTION WELLS
Survey of Industrial Waste Injection Wells, Volume II,
W73-12576 5E

Micellar Solutions Stimulate Wells,
W73-12762 8B

Waste Disposal Well Performance,
W73-12779 5E

The Design and Operation of Deep-Well Disposal System,
W73-12780 5E

The Disposal of Wastewater Underground,
W73-12781 5E

INLAND WATERWAYS
Estuarine Navigation Projects.
W73-12575 8B

INORGANIC CARBON
The Effect of Inorganic Carbon on Eutrophication,
W73-12392 5C

INORGANIC COMPOUNDS
Hydrochemical Description of the Onon-Argun' Steppe (Gidrokhimicheskaya kharakteristika Onon-Argunskoy stepi),
W73-12746 2K

INPUT-OUTPUT ANALYSIS
Outline of a Macro-Economic Analysis of Environmental Pollution: A Multi-Sectoral Approach,
W73-12683 6B

INPUT-OUTPUT ANALYSIS

Economic Effects of Technology Changes in Relation to the Environment,
W73-12685 6B

INSECTICIDES
Effects of Zectran Insecticide on Aquatic Organisms in Bear Valley Creek, Idaho,
W73-12634 5C

Insecticide Residues in Water and Sediment from Cisterns on the U.S. and British Virgin Islands - 1970,
W73-12894 5B

An Immobilized Cholinesterase Product for Use in the Rapid Detection of Enzyme Inhibitors in Air or Water,
W73-12901 5A

INSTITUTIONAL CONSTRAINTS
Evaluation of Urban Water Management Policies in the Denver Metropolitan Area,
W73-12510 5G

INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS
Trace Element Trapping in Pteropod Tests,
W73-12937 5B

INSTRUMENTATION
Measurement of Currents in the Great Lakes,
W73-12741 2H

Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol I - Chemistry,
W73-12753 2H

Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol II - Biology,
W73-12754 2H

Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol III - Physical,
W73-12755 2H

Auger Soil Sampler for Herbicide Residues,
W73-12794 2G

Real-Time Interactive Instrumentation,
W73-12850 7A

Additional Studies for the Spectrophotometric Measurement of Iodine in Water.
W73-12851 5A

Analytical Reviews 1973/Applications.
W73-12930 5A

INSURANCE
Flood Insurance for Virginia.
W73-12690 6F

Costs and Profitability in the Commercial Fishing Industry: The Insurance Dilemma,
W73-12699 6B

INTANGIBLE BENEFITS
Evaluation of Environmental Intangibles,
W73-12688 6B

INTERACTIVE COMPUTER SYSTEMS
Real-Time Interactive Instrumentation,
W73-12850 7A

INTERNATIONAL UNIFORM STANDARDS
The Role of Uniform Standards in International Environmental Management.
W73-12686 6B

INTERSTATE COMMISSIONS
Interim Areawide Water and Sewer Plan: Bel-O-Mar area.
W73-12362 5G

INTERTIDAL AREAS
Dispersion, Dispersal, and Persistence of the Annual Intertidal Alga, Postelsia Palmeformis Ruprecht,
W73-12883 5C

IODINE
Additional Studies for the Spectrophotometric Measurement of Iodine in Water.
W73-12851 5A

IODINE-IODIDE SPECTROSCOPY
Additional Studies for the Spectrophotometric Measurement of Iodine in Water.
W73-12851 5A

ION EXCHANGE
Ion Exchange Color and Mineral Removal from Kraft Bleach Wastes,
W73-12522 5D

Determination of Uranium in Urine Specimens Following Their Separation Through Anion Exchange, (Bestimmung Des Urans in Urinproben Nach Dessen Abtrennung Durch Anionenaustausch),
W73-12931 5A

ION EXCHANGE CHROMATOGRAPHY
Polyaromatic Hydrocarbons in High-Boiling Petroleum Distillates. Isolation by Gel Permeation Chromatography and Identification by Fluorescence Spectrometry,
W73-12875 5A

IOWA
Diatom Population Dynamics in a Central Iowa Drainage Ditch,
W73-12665 5C

IRON
Simultaneous Polarographic Determination of Iron (II) and Iron (III) in Coal Mine Waste Water,
W73-12976 5A

IRON-SULFUR SOLUTIONS
Aqueous Iron-Sulfur Systems in Rice Field Soils of Louisiana,
W73-12385 3F

IRRIGATION
Field Leaching by Sprinkler and Surface Irrigation During a Crop Season,
W73-12464 3F

The Quality of Drainage Water from Irrigated Black Cotton Soils for Irrigation,
W73-12650 3F

IRRIGATION SYSTEMS
Improvements in Moving Sprinkler Irrigation Systems for Conservation of Water,
W73-12507 3F

ISOLATION
Microbiology in the Aerobic Treatment of Farm Waste,
W73-12890 5D

Poliovirus in a Water Supply,
W73-12922 5B

ISRAEL
Hydrological Year-Book of Israel, 1970/71.
W73-12432 2A

ISRAEL (NEGEV DESERT)
Extreme Water Stress and Photosynthetic Activity of the Desert Plant Artemisia Herba-Alba Asso,
W73-12785 2I

ISSYK-KUL' DEPRESSION
Snow Cover of the Issyk-kul' Depression and Its Alpine Environment (Snezhnyy pokrov Issyk-Kul'skoy kotloviny i yeye vysokogornogo obramleniya),
W73-12726 2C

ITALY (VENICE)
Environmental Isotopes and Circulation in Aquifers Under Venice (Isotopes du Milieu et Circulations dans les Aquiferes du Sous-Sol Venitien),
W73-12419 2F

JAPAN
Influence of Land Reclamation and Waste Water from Paper Mill on Environment of 'Nori' (Porphyra Tenera) Culture Farm, (In Japanese),
W73-12639 5C

Salmonella Contamination of Rivers and Sewages in Fukuyama City, (In Japanese),
W73-12648 5C

Ecological Information on the Differences in the Number of Culex tritaeniorhynchus Larvae Among Paddy Fields (In Japanese),
W73-12829 3F

On The Water Pollution in the Area of Urban Development (In Japanese),
W73-12996 5B

JETTIES
Grays Harbor Estuary, Washington: Report 2. North Jetty Study,
W73-12581 8B

JOINTS (CONNECTIONS)
High Strength Bolted Galvanized Joints,
W73-12489 8G

JORDAN VALLEY
Sodium-Affected Soils in the Jordan Valley,
W73-12795 2G

JUNCTION CITY (ORE.)
Water Resource Decison Making--How Effective is the Public Input,
W73-12693 6B

JUVENILE FISH
Swimming Performance of Young Atlantic Salmon (Salmo salar) as Affected by Reduced Ambient Oxygen Concentration,
W73-12897 5C

The Effects of Sublethal Concentrations of Whole Bleached Kraftmill Effluent on the Growth and Food Conversion Efficiency of Underyearling Sockeye Salmon (Oncorhynchus nerka),
W73-12913 5C

KARST
Black Phytokarst From Hell, Cayman Islands, British West Indies,
W73-12593 2J

Karst of the Arabika Massif (Karst massiva Arabika),
W73-12742 2K

KARST HYDROLOGY
Karst of the Arabika Massif (Karst massiva Arabika),
W73-12742 2K

Hydraulics of Sheetlike Solution Cavities,
W73-12944 4B

KAY COUNTY (OKLA)
Kay County, Oklahoma, Water and Sewerage Comprehensive Plan.
W73-12364 5G

KAZAKHSTAN
Evaporation During a Flood Period Caused by Spring Snowmelt (Ispareniye v period vesennego snegotayaniya i polovod'ya),
W73-12442 2D

KINETICS
Wastewater Treatment Design Related to Biological Growth Supported by Activated Carbon,
W73-12494 5D

KIRCHNER MARSH (MINN.)
Stratigraphy of Fossil Pigments as a Guide to the Postglacial History of Kirchner Marsh, Minnesota,
W73-12386 5C

KRAFT MILLS
Detoxification of Kraft Pulp Mill Effluent by an Aerated Lagoon,
W73-12529 5D

Practical Decolorization of Kraft Mill Effluents (Praktyka usuwania barwy sciekow posiarczanowych),
W73-12544 5D

Microbiological Treatment Parameters of Bleached Kraft Pulp Mill Effluents,
W73-12551 5D

LABORATORY EQUIPMENT
An Improved AA Microsampling System,
W73-12865 5A

LABORATORY TESTS
Laboratory Investigations of the Transmission Capacity of Frozen and Thawed Soils Based on Data of the Valday Field Laboratory (Vnigl) (Laboratornyye issledovaniya vodopropusknoy sposobnosti merzlykh i talykh pochvo-gruntov (po materialam merzlothoy laboratorii VNIGL)),
W73-12437 2G

Some Short-Term Indicators of Sublethal Effects of Copper on Brook Trout, Salvelinus Fontinalis,
W73-12859 5C

Physiological Changes in Mytilus Edulis L. Induced by Temperature and Nutritive Stress,
W73-12878 5C

The Utilization of Leaf Litter by Stream Detritivores,
W73-12882 5C

Swimming Performance of Young Atlantic Salmon (Salmo salar) as Affected by Reduced Ambient Oxygen Concentration,
W73-12897 5C

LAGOONS
Long-Lived Pollutants in Sediments From the Laguna Atascosa National Wildlife Refuge, Texas,
W73-12595 5B

LAKE BUTTE DES MORTS (WIS)
The Sediments and History of Lake Butte des Morts, Wisconsin,
W73-12355 2J

LAKE CHELKAR
Radiation Regime of Lake Chelkar and Adjoining Regions (O radiatsionnom rezhime ozera Chelkar i prilegayushchey k nemu territorii),
W73-12724 2H

LAKE CHILWA
The Lake Chilwa Tilapia and Its Fishery,
W73-12642 2H

LAKE COUNTY (FLA)
Hydrologic Records for Lake County, Florida: 1971-72,
W73-12949 2E

LAKE ERIE
Evaluation of ERTS Data for Certain Oceanographic Uses,
W73-12429 7B

Lake Movements with Partial Ice Cover,
W73-12663 2H

LAKE HEFNER (OKLA)
Some Effects of Evaporation Suppression on Reservoir Ecology,
W73-12869 5C

LAKE MENDOTA
Nitrogen Release from Lake Sediments,
W73-12860 5B

LAKE MICHIGAN
Nutrient Enrichment and Eutrophication of Lake Michigan,
W73-12377 5C

Viruses in Metropolitan Waters: Concentration by Polyelectrolytes, Freeze Concentration, and Ultrafiltration,
W73-12867 5F

LAKE ONTARIO
Finite Element Shallow Lake Circulation Analysis,
W73-12413 2H

Evaluation of ERTS Data for Certain Oceanographic Uses,
W73-12429 7B

Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol 1 - Chemistry,
W73-12753 2H

Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol II - Biology,
W73-12754 2H

Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol III - Physical,
W73-12755 2H

LAKE RESTORATION
The Shagawa Lake Project: Lake Restoration by Nutrient Removal from Wastewater Effluent,
W73-12520 5D

LAKE SEDIMENTS
The Sediments and History of Lake Butte des Morts, Wisconsin,
W73-12355 2J

Gas Production in Sediments of Lake Mendota, Wisconsin,
W73-12378 5C

Degradation of Methylmercury by Bacteria Isolated from Environmental Samples,
W73-12620 5A

Nitrification in Sediments of Selected Wisconsin Lakes,
W73-12763 5C

Nitrogen Release from Lake Sediments,
W73-12860 5B

Phosphate Chemistry in Lake Sediments,
W73-12917 5C

LAKE SUPERIOR
Age, Growth Reproduction, and Food of the Burbot, Lota lota (Linnaeus), in Southwestern Lake Superior,
W73-12934 2H

LAKE TAHOE
Optical Properties and Color of Lake Tahoe and Crater Lake,
W73-12926 5A

LAKE TANGANYIKA
The Size at Maturity and Breeding Seasons of Sardines in Southern Lake Tanganyika,
W73-12649 2H

LAKE TROUT
Nitrogen Release from Lake Sediments,
W73-12860 5B

LAKE VICTORIA
The Food and Feeding Habits of the Small Mormyrid Fishes of Lake Victoria, East Africa,
W73-12641 2H

Exploratory Bottom Trawling in Lake Victoria,
W73-12803 2H

LAKEFRONT DEVELOPMENT
The Lakefront Plan of Chicago.
W73-12367 4C

LAKES
Finite Element Shallow Lake Circulation Analysis,
W73-12413 2H

The Shagawa Lake Project: Lake Restoration by Nutrient Removal from Wastewater Effluent,
W73-12520 5D

Selective Withdrawal from Man-Made Lakes, Hydraulic Laboratory Ivestigation,
W73-12569 4A

Biological Effects of Artificial Destratification and Aeration in Lakes and Reservoirs-Analysis and Bibliography,
W73-12625 5C

Radiation Regime of Lake Chelkar and Adjoining Regions (O radiatsionnom rezhime ozera Chelkar i prilegayushchey k nemu territorii),
W73-12724 2H

Investigation of Lake-Level Fluctuation Patterns and Moisture Conditions in the Middle and Southern Urals (Issledovaniye zakonomernostey kolebaniy urovnya ozer i uvlazhnennosti Srednego i Yuzhnogo Urala),
W73-12725 2H

LAND APPRAISALS
Stream Quality Preservation Through Planned Urban Development,
W73-12518 5G

LAND DEVELOPMENT
Standards for Soil Erosion and Sediment Control in New Jersey.
W73-12956 2J

LAND DISPOSAL
Land Disposal of Liquid Sewage Sludge: I. The Effect on Yield, in Vivo Digestibility, and Chemical Composition of Coastal Bermudagrass (Cynodon dactylon L. Pers.),
W73-12914 5D

LAND DRAINAGE (SLOPING)
Considerations for Effective Sloping Land Drainage Systems,
W73-12933 4A

LAND FORMING
Process-Form Variability of Multiclass Coasts: Baja California,
W73-12422 2L

Leaching Salty Soils,
W73-12789 2G

LAND RECLAMATION
Influence of Land Reclamation and Waste Water from Paper Mill on Environment of 'Nori' (Porphyra Tenera) Culture Farm, (In Japanese),
W73-12639 5C

LAND RESOURCES
The Visual Aspects of Resource Management,
W73-12407 4D

LAND USE
An Evaluation of Baltimore Harbor Land Use Potentials,
W73-12361 6B

The Lakefront Plan of Chicago.
W73-12367 4C

Stream Quality Preservation Through Planned Urban Development,
W73-12518 5G

Public Land Use Policy: Needs, Objectives, and Guidelines,
W73-12697 4A

LAND USE POLICY
Public Land Use Policy: Needs, Objectives, and Guidelines,
W73-12697 4A

LANDSCAPING
The Visual Aspects of Resource Management,
W73-12407 4D

Measuring Public Responses to Vegetative Management,
W73-12408 4D

LANDSLIDES
Catastrophic Rock Slide, Mount Huascaran, North-Central Peru, May 31, 1970,
W73-12409 2J

LARGEMOUTH BASS
The Seasonal Abundance of the Ancyrocephalinae (Monogenea) on Largemouth Bass in Walter F. George Reservoir,
W73-12978 2H

LAW ENFORCEMENT
Ontario Unhappy with Efforts of Industry to Halt Pollution,
W73-12538 5G

LEACHING
Field Leaching by Sprinkler and Surface Irrigation During a Crop Season,
W73-12464 3F

Leaching Salty Soils,
W73-12789 2G

LEAD
Lead Pollution: Records in Southern California Coastal Sediments,
W73-12589 5B

Biological Aspects of Lead: An Annotated Bibliography - Literature From 1950 through 1964. Parts I and II,
W73-12627 5C

Determination of Lead in Petroleum Additives Using Atomic Absorption Spectrophotometry,
W73-12864 5A

An Improved AA Microsampling System,
W73-12865 5A

LEAD RADIOISOTOPES
Biological Aspects of Lead: An Annotated Bibliography - Literature From 1950 through 1964. Parts I and II,
W73-12627 5C

LEAF LITTER
The Utilization of Leaf Litter by Stream Detritivores,
W73-12882 5C

LEAF WATER POTENTIAL
Diurnal and Seasonal Effects of Environment on Plant Water Relations and Fruit Diameter of Citrus,
W73-12805 3F

Evaluation of Tensiometers for Estimating Plant Water Stress in Citrus,
W73-12985 3F

LEAKY AQUIFERS
Evaluation of a Shallow Leaky Water Table Aquifer in a Subhumid Region of France,
W73-12941 2F

LEAST-COST ANALYSIS
Identification and Achievement of Environmental Quality Levels in Managing the Use of Natural Resources,
W73-12696 5G

LEAVES
Water Pathways in Higher Plants: III. The Transpiration Stream Within Leaves,
W73-12652 2I

Welwitschia Mirabilis: Paradox of the Namib Desert,
W73-12796 2I

Relative Water Content of Leaves: Underestimation Caused by Antitranspirant Film,
W73-12994 2D

LEGAL ASPECTS
Selection of a Suitable System of Effluent Purification (O vybore ratsional'noi sistemy ochistki stochnykh vod),
W73-12673 5D

LEGISLATION
Public Land Use Policy: Needs, Objectives, and Guidelines,
W73-12697 4A

LEMMON VALLEY (NEV)
Evaluation of the Water Resources of Lemmon Valley, Washoe County, Nevada, With Emphasis on Effects of Ground-Water Development to 1971,
W73-12718 4B

LENGTH-WEIGHT RATIOS (FISH)
Length-Weight Relationship and Condition Factors of Fishes From a South Carolina Reservoir Receiving Thermal Effluent,
W73-12774 5C

LEVEES
Chena River Lakes Project, Alaska, Problems Relating to Channel Development, Erosion, and Bank and Levee Protection,
W73-12559 8B

Control of Underseepage by Relief Wells, Trotters, Mississippi; Appendix K: 1969 Pumping Tests,
W73-12597 8B

LICHEN
Simplification of the Blue Mountain Lichen Communities Near a Zinc Factory,
W73-12973 5C

LIFE CYCLES
Annual Life Cycle and Production of the Chaetognath Sagitta elegans in Bedford Basin, Nova Scotia,
W73-12898 5B

LIGHT
Effects of Light and Temperature on Algal Growth,
W73-12396 5C

LIGHT PENETRATION
Optical Properties and Color of Lake Tahoe and Crater Lake,
W73-12926 5A

LIGNIN
Selection of a Suitable System of Effluent Purification (O vybore ratsional'noi sistemy ochistki stochnykh vod),
W73-12673 5D

LIME
Practical Decolorization of Kraft Mill Effluents (Praktyka usuwania barwy sciekow posiarczanowych),
W73-12544 5D

LIME SLUDGES
Study of Utilization and Disposal of Lime Sludges Containing Phosphates,
W73-12501 5D

LIMESTONES
Hydraulics of Sheetlike Solution Cavities,
W73-12944 4B

LIMITING FACTORS
The Effect of Inorganic Carbon on Eutrophication,
W73-12392 5C

Phosphorus and Eutrophication,
W73-12394 5C

Identification of the Limiting Nutrient and Specific Growth Rate,
W73-12861 5C

Ecological Studies of Codium fragile in New England, USA,
W73-12918 5C

Phytoplankton Algae: Nutrient Concentrations and Growth,
W73-12924 5C

LINDANE
DDT in Some New Zealand Marine and Freshwater Fauna,
W73-12925 5A

LINURON
Simultaneous Detection of the Residues of Atrazine and Linuron in Water, Soil, Plant, and Animal Samples by Thin-layer Chromatography,
W73-12811 5A

LIPIDS
Lipids in Shallow Bottom Sediments,
W73-12717 5B

LIQUID CHROMATOGRAPHY
Application of Liquid Chromatography to Pollution Abatement Studies of Munition Wastes,
W73-12877 5A

LIQUID SCINTILLATION
A Comparison of Liquid Scintillation and Geiger-Muller Estimates of Primary Productivity in an in Situ Experiment,
W73-12848 5A

An Evaluation of Liquid Scintillation Counting Techniques for Use in Aquatic Primary Production Studies,
W73-12907 5A

LIQUID WASTES
Cross-Flow Filtration Process for Removal of Total Organic Carbon and Phosphates from Aqueous Sewage Effluents,
W73-12460 5D

LITTORAL DRIFT
Forecasting Storm-Induced Beach Changes Along Virginia's Ocean Coast,
W73-12584 4A

LOBELIA
The Influence of Vegetation on the Redox Profile in the Sediment of Grane Langso, A Danish Lobelia Lake,
W73-12379 5C

LOCH CRERAN (SCOTLAND)
Community Structure of the Benthos in Scottish Sea-Lochs. II. Spatial Pattern,
W73-12855 5C

LOCH ETIVE (SCOTLAND)
Community Structure of the Benthos in Scottish Sea-Lochs. II. Spatial Pattern,
W73-12855 5C

LODZ (POLAND)
Construction Costs of Water Supply and Sewage Networks in Poland--1961-1970,
W73-12703 6C

LOGGING
Well Logs can Indicate Formation Drillability,
W73-12769 8E

LOUISIANA
Aqueous Iron-Sulfur Systems in Rice Field Soils of Louisiana,
W73-12385 3F

Mariculture in Estuarine Oil-Pipeline Canals in Louisiana,
W73-12951 5C

Standing Crops of Natural Fish Populations in Brackish-Water Oil Field Pipeline Canals,
W73-12952 5C

LOW ALLOY STEELS
Welding of a Normalized High Strength Low Alloy Plate Steel of Structural Quality,
W73-12466 8G

LUMBERING
Valuation of Timber, Forage and Water from National Forest Lands,
W73-12701 6B

LYSIMETERS
Application of Acrylic Plastic Tension Lysimeters to Sloping Land,
W73-12638 2G

MACROCONSUMERS
Energetics of Natural Populations of Freshwater Macroconsumers,
W73-12374 5C

MACROINVERTEBRATES
Community Structure of the Benthos in Scottish Sea-Lochs. II. Spatial Pattern,
W73-12855 5C

Biomass Characteristics of the Asidian Molgula Manhattensis (Dekay),
W73-12880 5A

MACROPHYTES
The Physiognomy and Structure of the Benthic Macrophyte Communities on Rocky Shores in the Southwestern Archipelago of Finland (Seili Islands),
W73-12929 5A

MAGNESIUM
Effect of Quality of Well Waters on the Germination and Mineral Composition of Wheat on Saline-Sodic Soils Rich in Magnesium,
W73-12809 3C

MAGNESIUM CARBONATE
Determination of Exchangeable Cations in Calcareous Soils,
W73-12786 2G

MAGNETIC FIELDS
Possibilities of Water Treatment by Means of a Magnetic Field,
W73-12481 5D

MAINE
History of Sedimentation in Montsweag Bay,
W73-12740 2L

MAIZE
Effect of Compaction on Yield and Uptake of N, P and K by Maize (Zea mays L.),
W73-12660 3F

MALAWI
The Lake Chilwa Tilapia and Its Fishery,
W73-12642 2H

MALFUNCTION
Detoxification of Kraft Pulp Mill Effluent by an Aerated Lagoon,
W73-12529 5D

MAMMALS
The Annual Cycle of Small Mammal Populations on a Zambian Floodplain,
W73-12814 2I

MANAGEMENT
Identification and Achievement of Environmental Quality Levels in Managing the Use of Natural Resources,
W73-12696 5G

Annual Literature Review: Administration, Systems Analysis,
W73-12840 5G

MANGANESE
Particulate Manganese in Sea Water Stressing Regimes in Marine Anoxic Basins,
W73-12854 5A

MAPS
Geohydrology of the Dover Area, Delaware,
W73-12425 7C

Horton's 1945 Study: A Cartobibliography,
W73-12596 7C

MARICULTURE STUDIES
Standing Crops of Natural Fish Populations in Brackish-Water Oil Field Pipeline Canals,
W73-12952 5C

MARINE ALGAE
Some Marine Diatoms from the Galapagos Islands,
W73-12902 2I

Ecological Studies of Codium fragile in New England, USA,
W73-12918 5C

Thorium in Water and Algae from the Adriatic Sea,
W73-12927 5A

MARINE ANIMALS
DDT in Some New Zealand Marine and Freshwater Fauna,
W73-12925 5A

MARINE BACTERIA
Selective Substrate Utilization by Marine Hydrocarbonoclastic Bacteria,
W73-12621 5B

A Study of Inorganic Salts Requirements and Effect on the Morphology of Marine Bacteria,
W73-12628 5C

Bacterial Content of Particulate Matter in Offshore Surface Waters,
W73-12912 5B

MARINE ENVIRONMENT
The Physiognomy and Structure of the Benthic Macrophyte Communities on Rocky Shores in the Southwestern Archipelago of Finland (Seili Islands),
W73-12929 5A

MARINE FISH
Design of Trapnet with Interchangeable Parts for the Capture of Large and Small Fishes from Varying Depths,
W73-12899 8I

MARINE HABITATS
The Association of Amphipods in the Shallow-Water Sand Habitat of Strangford Lough, Co. Down,
W73-12879 5A

MARINE ORGANISMS
Aqualculutre: The Farming and Husbandry of Freshwater and Marine Organisms,
W73-12830 3F

MARINE PLANTS
The Physiognomy and Structure of the Benthic Macrophyte Communities on Rocky Shores in the Southwestern Archipelago of Finland (Seili Islands),
W73-12929 5A

MARION LAKE (BRITISH COLUMBIA)
Some Effects of Artificial Fertilization on Enclosed Plankton Populations in Marion Lake, British Columbia,
W73-12384 5C

MARKET VALUE
The Set up of the Statistical System Within Which the Deterioration of the Human Environment will be Estimated,
W73-12681 6B

MARKING (FISH BRANDING)
Use of Cold Brands on Channel Catfish,
W73-12778 8I

MARSH PLANTS
The Sediments and History of Lake Butte des Morts, Wisconsin,
W73-12355 2J

MARSHES
Stratigraphy of Fossil Pigments as a Guide to the Postglacial History of Kirchner Marsh, Minnesota,
W73-12386 5C

MARYLAND
Regional Sewer System, Planning and Cost Estimation Model,
W73-12357 5G

Outdoor Recreation in the Baltimore Area.
W73-12360 6D

An Evaluation of Baltimore Harbor Land Use Potentials,
W73-12361 6B

Observations of Intermediate and Small Scale Turbulent Water Motion in a Stratified Estuary (Parts I and II),
W73-12424 2L

Hydrogeology of the Carbonate Rocks, Frederick and Hagerstown Valleys, Maryland,
W73-12719 4B

MASS SPECTOMETRY
Instrumental and Numerical Considerations for On-Line Interpretation of High Resolution Mass Spectral Data,
W73-12874 2K

MASSACHUSETTS
Lipids in Shallow Bottom Sediments,
W73-12717 5B

MATHEMATICAL ANALYSIS
Rational Design of Well Screens,
W73-12771 8B

MATHEMATICAL MODELS
Mathematical modeling of Phytoplankton Populations,
W73-12399 5C

Fluidized Bed Clarification as Applied to Wastewater Treatment,
W73-12505 5D

Coordination of Agricultural and Urban Water Quality Management in the Utah Lake Drainage Area,
W73-12508 5G

Mathematical Modeling of Water Management Strategies in Urbanizing River Basins,
W73-12509 5G

Evaluation of Urban Water Management Policies in the Denver Metropolitan Area,
W73-12510 5G

Recondition and Reuse of Organically Contaminated Waste Sodium Chloride Brines,
W73-12521 5D

Mathematical Simulation of the Turbidity Structure within an Impoundment; Hydraulic Laboratory Investigation,
W73-12562 8B

Wind-Driven Model for Evaporite Deposition in a Layered Sea,
W73-12594 2J

Mathematical Models in Ecology, Proceedings of the 12th Symposium.
W73-12653 6A

Outline of a Macro-Economic Analysis of Environmental Pollution: A Multi-Sectoral Approach,
W73-12683 6B

Evaluation of the Economic Effects of Anti-Pollution Public Policy,
W73-12684 6B

Externalities, Welfare, And the Feasibility of Corrective Taxes,
W73-12694 6B

Mathematical Modeling for Environmental Pollution Control,
W73-12711 5G

Prediction of Unsteady Salinity Intrusion in Estuaries: Mathematical Model and User's Manual,
W73-12728 2L

Identification of the Limiting Nutrient and Specific Growth Rate,
W73-12861 5C

A Mathematical Model of the Nutrient Dynamics of Phytoplankton in a Nitrate-Limited Environment,
W73-12915 5C

MATHEMATICAL STUDIES
Simplified Solution for Decreasing Flow in Wells,
W73-12759 8B

MATURITY
The Size at Maturity and Breeding Seasons of Sardines in Southern Lake Tanganyika,
W73-12649 2H

MAYAK
Mayak, Russian Wild Ryegrass,
W73-12974 4A

MAYFLIES
Microdistribution and Density as Factors Affecting the Downstream Drift of Mayflies,
W73-12888 2I

Annual Production of a Stream Mayfly Population: A Comparison of Methods,
W73-12905 5B

MEANDERS
River Channel Change With Time: An Example,
W73-12590 2J

The Superimposition Hypothesis for Incised Meanders--A General Rejecton and Specific Test,
W73-12736 2E

Climatic Change and Arrested Meander Development on the River Severn,
W73-12737 4A

MEASUREMENT
Identification and Measurement of Environmental Pollutants. Symposium.
W73-12655 5A

Peter Bohm.
W73-12680 6B

Membrane Filter Retention--A Source of Error in the C-14 Method of Measuring Primary Production,
W73-12908 5A

MEASUREMENTS
Effects of Air Gaps and Saturated Voids on Accuracy of Neutron Moisture Measurements,
W73-12636 2G

MELAMINE RESINS
Determination of Melamine-Formaldehyde Resin in White Waters (Opredelenie soderzhaniya melamino-formaldegidnoi smoly v podsetochnykh vodakh),
W73-12672 5A

MEMBRANE FILTERS
Membrane Filter Retention--A Source of Error in the C-14 Method of Measuring Primary Production,
W73-12908 5A

MERCURY
Process and Apparatus for Removing Mercury from Waste Water,
W73-12449 5D

Mercury Levels in Wisconsin Fish and Wildlife,
W73-12812 5A

Mercury in Fish: Some Toxicological Considerations,
W73-12826 5C

Uptake of Mercury by Caged Rainbow Trout (Salmo Gairdneri) in the South Saskatchewan River,
W73-12857 5C

Total Mercury Analysis: Review and Critique,
W73-12885 5A

Mercury Distribution in Estuarine-Nearshore Environment,
W73-12920 5B

Mercury in Canadian Fish,
W73-12970 5C

MERCURY CONTAMINATION
The Crayfish, Orconectes Virilis, As an Indicator of Mercury Contamination,
W73-12632 5A

METABOLISM
The Kinetics of Microbiological Modification of Organic Substances in Natural Waters,
W73-12712 5B

METAL PIPES
Cathodic Protection for Coated Steel Pipelines,
W73-12765 8G

METALLURGY
Corrosion of Metals in Tropical Waters---Structural Ferrous Metals,
W73-12772 8G

METEOROLOGICAL CONDITIONS
Simulations of Meteorological Variations Over Arctic Coastal Tundra Under Various Physical Interface Conditions,
W73-12983 2B

METEOROLOGICAL DATA
Climatology of Rainfall Probabilities for Oahu, Hawaii,
W73-12587 2B

METHODOLOGY
Preparation and Properties of 3-Trifluoromethyl-4-Aminophenol,
W73-12622 5B

A Comparison of Liquid Scintillation and Geiger-Muller Estimates of Primary Productivity in an in Situ Experiment,
W73-12848 5A

Steam Distillation: A Simple Technique for Recovery of Petroleum Hydrocarbons from Tainted Fish,
W73-12849 5A

A Simple Method for Recording Fish Heart and Operculum Beats Without the Use of Implanted Electrodes,
W73-12858 7B

Viruses in Metropolitan Waters: Concentration by Polyelectrolytes, Freeze Concentration, and Ultrafiltration,
W73-12867 5F

Total Mercury Analysis: Review and Critique,
W73-12885 5A

ATP Pools in Pure and Mixed Cultures,
W73-12887 5A

The Use of Fish as Sensors in Industrial Waste Lines to Prevent Fish Kills,
W73-12889 5C

Microbiology in the Aerobic Treatment of Farm Waste,
W73-12890 5D

A Method for High Speed BCD-to-Binary Conversion,
W73-12892 7C

Annual Production of a Stream Mayfly Population: A Comparison of Methods,
W73-12905 5B

Sugar-Coated Daphnia: A Preservation Technique for Cladocera,
W73-12910 5A

Analytical Reviews 1973/Applications.
W73-12930 5A

Determination of Alkylbenzenesulfonate (ABS) in Bottom Sediment,
W73-12932 5A

METHYLMERCURY
Degradation of Methylmercury by Bacteria Isolated from Environmental Samples,
W73-12620 5A

MEXICO
Process-Form Variability of Multiclass Coasts: Baja California,
W73-12422 2L

MICHIGAN
Energetics of Natural Populations of Freshwater Macroconsumers,
W73-12374 5C

Effects of Submerged Sills in the St. Clair River; Hydraulic Model Investigation,
W73-12572 8B

Extension of Range of the Triclad Turbellarian Phagocata Gracilis (Haldeman),
W73-12856 2I

Poliovirus in a Water Supply,
W73-12922 5B

MICROBIAL DEGRADATION
Degradation of Methylmercury by Bacteria Isolated from Environmental Samples,
W73-12620 5A

Microbiology in the Aerobic Treatment of Farm Waste,
W73-12890 5D

Bacterial Degradation of Detergent Compounds,
W73-12938 5B

MICROORGANISMS
The Kinetics of Microbiological Modification of Organic Substances in Natural Waters,
W73-12712 5B

Identification of the Limiting Nutrient and Specific Growth Rate,
W73-12861 5C

MICROSAMPLING SYSTEM
An Improved AA Microsampling System,
W73-12865 5A

MICROSCOPY
Correlated Light and Electron Microscope Studies on Brown Algae. II. Physode Production in Dictyota,
W73-12388 5C

MIDDLE FORK FEATHER RIVER (CALIF)
Water Quality in the Middle Fork Feather River, California, May 1970 Through September 1971,
W73-12720 5A

MIDGES
Biologically Active Compounds in the Aquatic Environment: The Uptake and Distribution of (1,1-Dichloro-2,2-Bis (P-Chlorophenyl) Ethylene), DDE by Chironomus tentans Fabricius (Diptera: Chironomidae),
W73-12804 5B

MIGRATION PATTERNS
The Zooplankton of the Gulf of Guinea,
W73-12623 5A

MINE DRAINAGE
Control of Mine Drainage from Coal Mine Mineral Wastes - Phase II - Pollution Abatement and Monitoring,
W73-12516 5G

MINE WASTE WATER
Simultaneous Polarographic Determination of Iron (II) and Iron (III) in Coal Mine Waste Water,
W73-12976 5A

MINE WASTES
Control of Mine Drainage from Coal Mine Mineral Wastes - Phase II - Pollution Abatement and Monitoring,
W73-12516 5G

MINE WATER
New Applications of Geophysical Methods to Ground-Water Problems in Pennsylvania,
W73-12783 2F

MINERAL INDUSTRY
Flotation Machine with Vertically Reciprocating Aerators,
W73-12452 5D

MINING
Environmental Cost of Mining,
W73-12687 5G

MINNESOTA
Stratigraphy of Fossil Pigments as a Guide to the Postglacial History of Kirchner Marsh, Minnesota,
W73-12386 5C

The Shagawa Lake Project: Lake Restoration by Nutrient Removal from Wastewater Effluent,
W73-12520 5D

Effects of Stream Channeling on Wetlands in a Minnesota Watershed,
W73-12667 4A

Fishes of the Yellow Medicine River in Southwestern Minnesota,
W73-12821 2I

Annual Production of a Stream Mayfly Population: A Comparison of Methods,
W73-12905 5B

MISSISSIPPI
A Study of Selected Aspects of Rural Water System Development in Mississippi,
W73-12492 6B

Economic and Related Impacts of Rural Water Systems in Mississippi,
W73-12493 6B

The Effect of Price and Other Selected Variables on Water Consumption,
W73-12495 6B

Outlet Works Stilling Basin for Tallahala Dam, Tallahala Creek, Mississippi; Hydraulic Model Investigation,
W73-12568 8B

MISSISSIPPI RIVER
Control of Underseepage by Relief Wells, Trotters, Mississippi; Appendix K: 1969 Pumping Tests,
W73-12597 8B

MISSOURI
Shoaling Conditions, St. Louis Harbor, Mississippi River; Hydraulic Model Investigation,
W73-12570 8B

MISSOURI RIVER
Characterization of Chemical Sludges,
W73-12871 5A

MIXING
Prediction of Mixing Lengths for River Flow Gaging,
W73-12414 5B

MIXTURES
Voltammetric Study of the Hydrogen Ion/Hydrogen Couple in Acetonitrile/Water Mixtures,
W73-12872 2K

MODEL STUDIES
Critical Review of Currently Available Water Quality Models,
W73-12352 6A

Regional Sewer System, Planning and Cost Estimation Model,
W73-12357 5G

Turbine Design and Performance for the Mersey-Forth Hydro Power Development,
W73-12486 8C

Hydrologic Models for Poorly Defined Drainage Areas,
W73-12496 2A

Simulation Study of Phytoplankton Photosynthesis and Growth in the Fraser River Estuary,
W73-12919 5C

MOISTURE
Investigation of Lake-Level Fluctuation Patterns and Moisture Conditions in the Middle and Southern Urals (Issledovaniye zakonomernostey kolebaniy urovnya ozer i uvlazhnennosti Srednego i Yuzhnogo Urala),
W73-12725 2H

MOISTURE CONTENT
Water Content in Convective Storm Clouds,
W73-12536 2B

MOISTURE STRESS
Extreme Water Stress and Photosynthetic Activity of the Desert Plant Artemisia Herba-Alba Asso,
W73-12785 2I

MOISTURE UPTAKE
Welwitschia Mirabilis: Paradox of the Namib Desert,
W73-12796 2I

MOLECULAR STRUCTURE
PCBs and DDT,
W73-12402 5C

MOLGULA MANHATTENSIS
Biomass Characteristics of the Asidian Molgula Manhattensis (Dekay),
W73-12880 5A

MONITORING
The TTC Test for the Control of Effluent Purification (Test TTC - Narzedziem kontroli procesu oczyszczania),
W73-12535 5D

Water Pollution in the Pulp and Paper Industry. II. Testing Methods,
W73-12554 5A

The Monitoring of Organic Matter with Polyurethane Foam,
W73-12868 5A

ATP Pools in Pure and Mixed Cultures,
W73-12887 5A

An Immobilized Cholinesterase Product for Use in the Rapid Detection of Enzyme Inhibitors in Air or Water,
W73-12901 5A

MONOGENEA
The Seasonal Abundance of the Ancyrocephalinae (Monogenea) on Largemouth Bass in Walter F. George Reservoir,
W73-12978 2H

MONTSWEAG BAY (MAINE)
History of Sedimentation in Montsweag Bay,
W73-12740 2L

MORTALITY
The Utilization of Leaf Litter by Stream Detritivores,
W73-12882 5C

MORTALITY COEFFICIENTS
Estimation of Mortality Coefficients from Field Samples of Zooplankton,
W73-12906 5C

MOSQUITOES
Parasitism of Mosquitoes by Water Mites,
W73-12987 2I

MOSQUITOS
Ecological Information on the Differences in the Number of Culex tritaeniorhynchus Larvae Among Paddy Fields (In Japanese),
W73-12829 3F

MOSSES
Observations of Tufa Deposition,
W73-12730 2K

MOTIVATION
Measuring and Developing Methods of Attitude and Motivational Change in Implementing the Big Blue River Basin Water Plan,
W73-12491 6B

MOTTLE VIRUS
Viruses Infecting Peaches in the Murrumbidgee Irrigation Areas of New South Wales,
W73-12981 3F

MOUNTAINS
Investigation of Lake-Level Fluctuation Patterns and Moisture Conditions in the Middle and Southern Urals (Issledovaniye zakonomernostey kolebaniy urovnya ozer i uvlazhnennosti Srednego i Yuzhnogo Urala),
W73-12725 2H

Snow Cover of the Issyk-kul' Depression and Its Alpine Environment (Snezhnyy pokrov Issyk-Kul'skoy kotloviny i yeye vysokogornogo obramleniya),
W73-12726 2C

Karst of the Arabika Massif (Karst massiva Arabika),
W73-12742 2K

MT HUASCARAN
Catastrophic Rock Slide, Mount Huascaran, North-Central Peru, May 31, 1970,
W73-12409 2J

MUDS
Bacteria of Muds Colonized by Spartina Townsendii and their Possible Role in Spartina Die-Back,
W73-12705 2L

MULCH
Protein Content of Brown Rice by Upland Polyethylene Film Mulching Culture, (In Japanese),
W73-12806 3F

MULCHES
Stone and Woodchip Mulches for Erosion Control on Construction Sites,
W73-12463 4D

MULCHING
Stone and Woodchip Mulches for Erosion Control on Construction Sites,
W73-12463 4D

MULTIPLE PURPOSE PROJECTS
The Multipurpose Development of the River Rhone Valley,
W73-12467 4A

MUNICIPAL WASTES
Activated Sludge Treatment with Oxygen,
W73-12586 5D

MURDERKILL RIVER (DEL)
Trace Metal Baseline Studies on the Murderkill and St Jones Rivers, Delaware Coastal Plain,
W73-12959 5B

MUSSELS
Mussels in the Unique Nickajack Dam Construction Site, Tennessee River, 1965,
W73-12800 2I

NAMIB DESERT (SOUTH WEST AFRICA)
Welwitschia Mirabilis: Paradox of the Namib Desert,
W73-12796 2I

NARA RIVER (USSR)
Optimum Conditions for the Discharge of Paper Industry Effluents (Optimal'noe vodootvedenie stokov bumazhnogo proizvodstva),
W73-12547 5G

NATIONAL FORESTS
Valuation of Timber, Forage and Water from National Forest Lands,
W73-12701 6B

NATURAL OIL SEEPAGE
Investigation of the Nature, Extent and Fate of Natural Oil Seepage Off Southern California,
W73-12958 5B

NAVIGABLE WATERS
Proposed Oil Pollution Regulations, (Final Environmental Statement).
W73-12955 5G

NAVIGATION
Effects of Submerged Sills in the St. Clair River; Hydraulic Model Investigation,
W73-12572 8B

Estuarine Navigation Projects.
W73-12575 8B

Maintenance of the Hudson River Channel, New York, Navigation Project, (Final Environmental Statement).
W73-12588 8B

NAVIGATION CHANNELS
Delaware Estuary, Pennsylvania, New Jersey, and Delaware, Long-Range Dredged Spoil Disposal Problem.
W73-12560 5E

Effects of Proposed Dock Expansion at Newport News on Tides, Currents, and Shoaling; Hydraulic Model Investigation,
W73-12566 8B

Sea-Land Navigation Studies; Hydraulic Model Investigation,
W73-12567 8B

Navigation Channel Improvement, Gastineau Channel, Alaska; Hydraulic Model Investigation,
W73-12571 8A

NEARSHORE WATERS
Mercury Distribution in Estuarine-Nearshore Environment,
W73-12920 5B

NEBRASKA
Measuring and Developing Methods of Attitude and Motivational Change in Implementing the Big Blue River Basin Water Plan,
W73-12491 6B

Hydrologic Models for Poorly Defined Drainage Areas,
W73-12496 2A

Nutrients in Nebraska's Waters,
W73-12615 5B

NEKTON
Selectivity of Towed-Net Samplers,
W73-12669 7B

NELSON AND WALSH COUNTIES (N DAK)
Ground-Water Resources, Nelson and Walsh Counties, North Dakota,
W73-12578 2F

Geology of Nelson and Walsh Counties, North Dakota,
W73-12579 2F

NET ATTITUDE CHANGE
Measuring and Developing Methods of Attitude and Motivational Change in Implementing the Big Blue River Basin Water Plan,
W73-12491 6B

NET RETURN
Public Support of Private Water Resource Development in Agriculture--With Implications for Firm Growth,
W73-12698 4B

NEUTRALIZATION
Neutralization of Metal Containing Wastes,
W73-12462 5D

NEUTRON ACTIVATION ANALYSIS
Optimum Procedure for the Determination of Selenium in Biological Specimens Using Se-77m Neutron Activation,
W73-12876 5A

Thorium in Water and Algae from the Adriatic Sea,
W73-12927 5A

NEVADA
Evaluation of the Water Resources of Lemmon Valley, Washoe County, Nevada, With Emphasis on Effects of Ground-Water Development to 1971,
W73-12718 4B

Sources of Data for Evaluation of Selected Geothermal Areas in Northern and Central Nevada,
W73-12947 4B

NEW ENGLAND
Ecological Studies of Codium fragile in New England, USA,
W73-12918 5C

NEW GUINEA (MT. ALBERT EDWARD)
High-Altitude Forests and Grasslands of Mt. Albert Edward, New Guinea,
W73-12824 4A

NEW JERSEY
Standards for Soil Erosion and Sediment Control in New Jersey.
W73-12956 2J

NEW MEXICO
A Comparison of Rates of Water Loss Through Transpiration of Several Southern New Mexico Phreatophyte Species,
W73-12497 2D

NEW YORK
Annual Report of the New York State Urban Development Corporation, 1972.
W73-12356 3D

Comprehensive Public Water Supply Study for Schenectady County, New York.
W73-12358 3D

Summary Report: Comprehensive Sewerage Study for Schenectady County, New York.
W73-12359 5G

Town of Cairo Waste Water Report.
W73-12366 5D

Sea-Land Navigation Studies; Hydraulic Model Investigation,
W73-12567 8B

NEW ZEALAND
DDT in Some New Zealand Marine and Freshwater Fauna,
W73-12925 5A

NEW ZEALAND LAKES
Chemistry and Trophic Status of Seven New Zealand Lakes,
W73-12928 5C

NEWPORT NEWS
Effects of Proposed Dock Expansion at Newport News on Tides, Currents, and Shoaling; Hydraulic Model Investigation,
W73-12566 8B

NEXT-USE APPROACH
Identification and Achievement of Environmental Quality Levels in Managing the Use of Natural Resources,
W73-12696 5G

NIAGARA RIVER
The Niagara River Pollution Abatement Progress - 1971.
W73-12380 5G

NITRATES
An Investigation of the Nitrate Problem in Runnels County, Texas,
W73-12514 5B

Rapid Field Determination of Nitrate in Natural Waters,
W73-12810 2K

A Mathematical Model of the Nutrient Dynamics of Phytoplankton in a Nitrate-Limited Environment,
W73-12915 5C

NITRIFICATION
Nitrification in Sediments of Selected Wisconsin Lakes,
W73-12763 5C

Effect of Level of Soil Moisture on Nitrogen Mineralization and Nitrification During Incubation of East Pakistan Tea Soils,
W73-12799 3F

NITRILOTRIACETATE (TRISODIUM)
Trisodium Nitrilotriacetate in Drinking Water: Metabolic and Renal Effects in Rats,
W73-12982 5C

NITROGEN
Nutrient Enrichment and Eutrophication of Lake Michigan,
W73-12377 5C

A Nitrogen Correction for Caloric Values,
W73-12383 5A

Nitrogen: Recent Studies on the Role of Nitrogen in the Biostimulation and Eutrophication of Aquatic Ecosystems,
W73-12393 5C

Nutrients in Nebraska's Waters,
W73-12615 5B

Effects of Various Soil Moisture Regimes and Different Levels of Nitrogen and Different Spacings of the Quality of Potato Tubers (Solanum Tuberosum L.),
W73-12640 3F

Effect of Compaction on Yield and Uptake of N, P and K by Maize (Zea mays L.),
W73-12660 3F

Soil Nitrogen Balance in Selected Row-Crop Sites in Southern California,
W73-12670 3F

Nitrogen Release from Lake Sediments,
W73-12860 5B

The Mechanisms of Nitrogen Assimilation in Pseudomonads,
W73-12881 5C

Effects of Aeration, Water Supply, and Nitrogen Source on Growth and Development of Tupelo Gum and Bald Cypress,
W73-12923 2I

Nitrogen Loss from Flooded Soil,
W73-12967 2G

Effects of Water Stress on Nitrogen-Fixing Root Nodules: IV. Effects on Whole Plants of Vicia faba and Glycine max,
W73-12977 3F

NITROGEN COMPOUNDS
Nitrogen Release from Lake Sediments,
W73-12860 5B

NITROGEN CYCLE
The Nitrogen Cycle in Sediment-Water Systems,
W73-12843 5C

NITROGEN FERTILIZATION
Effect of Varying Water Management Practices on the Growth, Yield and Nitrogen Uptake by High-Yielding Rice Varieties,
W73-12583 3F

NITROGEN FIXATION
Flow of Microbially Fixed Nitrogen in a Model Ecosystem,
W73-12847 5B

NITROGEN FIXING BACTERIA
Flow of Microbially Fixed Nitrogen in a Model Ecosystem,
W73-12847 5B

NITROGEN ISOTOPE RATIO
An Investigation of the Nitrate Problem in Runnels County, Texas,
W73-12514 5B

NITROGEN RELEASE
Nitrogen Release from Lake Sediments,
W73-12860 5B

NONAQUEOUS SOLUTIONS
Voltammetric Study of the Hydrogen Ion/Hydrogen Couple in Acetonitrile/Water Mixtures,
W73-12872 2K

NORTH CAROLINA
Sediment Resulting From Construction of an Interstate Highway in the Piedmont Area of North Carolina,
W73-12713 4C

A Hydrographic Atlas of Larger North Carolina Sounds,
W73-12948 2L

NORTH DAKOTA
Ground-Water Resources, Nelson and Walsh Counties, North Dakota,
W73-12578 2F

Geology of Nelson and Walsh Counties, North Dakota,
W73-12579 2F

Studies on Helminths of North Dakota: IV. Parasites of the River Carpsucker, Carpiodes carpio, with Descriptions of Three New Species (Monogenea),
W73-12984 2I

NORTH DAKOTA (LAKE ASHTABULA)
Benthic Invertebrates in Lake Ashtabula Reservoir, North Dakota,
W73-12863 5C

NUCLEAR EXPLOSIONS
Radiochemical Monitoring of Water After the Cannikin Event, Amchitka Island, Alaska, October, 1972,
W73-12945 5B

NUISANCE BLOOMS
Sources of CO2 for Nuisance Blooms of Algae,
W73-13000 5C

NUTRIENT
Nutrient Uptake by Tupelo Gum and Bald Cypress from Saturated or Unsaturated Soil,
W73-12828 2I

NUTRIENT ABSORPTION (PLANTS)
Influence of Different Moisture Regimes and Methods of Phosphate Application on Growth and Nutrient Absorption by Wheat (Triticum Aestivum L.),
W73-12539 3F

NUTRIENT CYCLING (MINERALS)
Investigation of Mineral Nutrient Cycling in Upland Piedmont Forest,
W73-12700 4A

NUTRIENT INTERCHANGE
Phosphate Chemistry in Lake Sediments,
W73-12917 5C

NUTRIENT REMOVAL
Nutrient Control in North San Francisco Bay,
W73-12398 5C

Cross-Flow Filtration Process for Removal of Total Organic Carbon and Phosphates from Aqueous Sewage Effluents,
W73-12460 5D

Phosphorus Removal and Plant Operation Studies at Fort Wayne, Indiana,
W73-12500 5D

The Shagawa Lake Project: Lake Restoration by Nutrient Removal from Wastewater Effluent,
W73-12520 5D

NUTRIENT REQUIREMENTS
A Study of Inorganic Salts Requirements and Effect on the Morphology of Marine Bacteria,
W73-12628 5C

Phytoplankton Algae: Nutrient Concentrations and Growth,
W73-12924 5C

NUTRIENTS
Sediment-Water Nutrient Interchange in Eutrophic Lakes,
W73-12395 5C

Nutrients in Nebraska's Waters,
W73-12615 5B

Chemistry and Trophic Status of Seven New Zealand Lakes,
W73-12928 5C

NUTRITIVE STRESS
Physiological Changes in Mytilus Edulis L. Induced by Temperature and Nutritive Stress,
W73-12878 5C

OAHU (HAWAII)
Tritium Measurement of Natural Waters on Oahu, Hawaii: A Preliminary Interpretation (Sampling Period: July 1969 to June 1970),
W73-12499 5A

Climatology of Rainfall Probabilities for Oahu, Hawaii,
W73-12587 2B

OAKLEY DAM (ILL)
Spillway for Oakley Dam, Sangamon River, Illinois-Appendix A: Type 2 (Revised) Spillway,
W73-12582 8A

OCHROMONAS DANICA
Effect of Incubation Temperature on the Macromolecular and Lipid Content of the Phytoflagellate Ochromonas danica,
W73-12896 5C

OHIO
Interim Areawide Water and Sewer Plan: Bel-O-Mar area.
W73-12362 5G

Parasitism of Mosquitoes by Water Mites,
W73-12987 2I

OHIO RIVER
Interim Areawide Water and Sewer Plan: Bel-O-Mar area.
W73-12362 5G

OIL
Determination of Lead in Petroleum Additives Using Atomic Absorption Spectrophotometry,
W73-12864 5A

Investigation of the Nature, Extent and Fate of Natural Oil Seepage Off Southern California,
W73-12958 5B

OIL INDUSTRY
Impact of Costs Associated with New Environmental Standards Upon the Petroleum Refining Industry. Part I. The Impact of Environmental Control Costs.
W73-12708 5G

Petroleum...40 Years of Research,
W73-12768 3E

Proposed Oil Pollution Regulations, (Final Environmental Statement).
W73-12955 5G

Channel Erosion Surveys Along Proposed Taps Route, Alaska, July 1971,
W73-12957 2J

OIL POLLUTION
Vessel for the Removal of Oil on Water,
W73-12448 5G

Pollutant Recovery System,
W73-12456 5G

Biological Effects of Oil Pollution - Selected Bibliography II,
W73-12626 5C

OIL SPILLS
Control of Oil and Other Hazardous Materials.
W73-12427 5G

Vessel for the Removal of Oil on Water,
W73-12448 5G

Pollutant Recovery System,
W73-12456 5G

Proposed Oil Pollution Regulations, (Final Environmental Statement).
W73-12955 5G

OIL WELLS
Here's a New Sand Pack Method,
W73-12761 8G

Micellar Solutions Stimulate Wells,
W73-12762 8B

OILY WATER
Mariculture in Estuarine Oil-Pipeline Canals in Louisiana,
W73-12951 5C

Standing Crops of Natural Fish Populations in Brackish-Water Oil Field Pipeline Canals,
W73-12952 5C

OKANAGAN LAKE
Crustacean Plankton and the Eutrophication of Lakes in the Okanagan Valley, British Columbia,
W73-12624 5C

OKLAHOMA
Systems Approach to Metropolitan and Regional Area Water and Sewer Planning,
W73-12351 6A

Kay County, Oklahoma, Water and Sewerage Comprehensive Plan.
W73-12364 5G

Some Effects of Evaporation Suppression on Reservoir Ecology,
W73-12869 5C

ON-SITE DATA COLLECTIONS
The Use of Fish as Sensors in Industrial Waste Lines to Prevent Fish Kills,
W73-12889 5C

Estimation of Mortality Coefficients from Field Samples of Zooplankton,
W73-12906 5C

ON-SITE TEST
A Comparison of Liquid Scintillation and Geiger-Muller Estimates of Primary Productivity in an in Situ Experiment,
W73-12848 5A

ON-SITE TESTS
Uptake of Mercury by Caged Rainbow Trout (Salmo Gairdneri) in the South Saskatchewan River,
W73-12857 5C

ONION ROOTS
Characterization of Exudation from Excised Roots of Onion, Allium Cepa: I. Water Flux,
W73-12989 3F

ONON-ARGUN' STEPPE
Hydrochemical Description of the Onon-Argun' Steppe (Gidrokhimicheskaya kharakteristika Onon-Argunskoy stepi),
W73-12746 2K

ONTARIO
Ontario Unhappy with Efforts of Industry to Halt Pollution,
W73-12538 5G

OPEN CHANNEL FLOW
Computing Backwater at Open Channel Constrictions,
W73-12415 8B

Computer Determination of Critical Depth Control Points in Open Channel Flow,
W73-12483 8B

Effective Hydraulic Roughness for Channels Having Bed Roughness Different from Bank Roughness; A State-Of-The-Art Report,
W73-12565 8B

OPEN SPACES
Stream Quality Preservation Through Planned Urban Development,
W73-12518 5G

OPERCULAR BEATS
A Simple Method for Recording Fish Heart and Operculum Beats Without the Use of Implanted Electrodes,
W73-12858 7B

OPTICAL PROPERTIES
Optical Properties and Color of Lake Tahoe and Crater Lake,
W73-12926 5A

OPTIMAL DEVELOPMENT PLANS
Mathematical Modeling of Water Management Strategies in Urbanizing River Basins,
W73-12509 5G

Evaluation of Urban Water Management Policies in the Denver Metropolitan Area,
W73-12510 5G

OPTIMIZATION
Coordination of Agricultural and Urban Water Quality Management in the Utah Lake Drainage Area,
W73-12508 5G

Externalities, Welfare, And the Feasibility of Corrective Taxes,
W73-12694 6B

Mathematical Modeling for Environmental Pollution Control,
W73-12711 5G

Real-Time Interactive Instrumentation,
W73-12850 7A

OREGON
Tertiary Treatment of Combined Domestic and Industrial Wastes,
W73-12512 5D

Water Resource Decison Making--How Effective is the Public Input,
W73-12693 6B

Optical Properties and Color of Lake Tahoe and Crater Lake,
W73-12926 5A

ORGANIC ACIDS
A Relationship between Heterotrophic Utilization of Organic Acids and Bacterial Populations in West Blue Lake, Manitoba,
W73-12903 5C

ORGANIC COMPOUNDS
Studies on the Growth of Phaeodactylum Tricornutum. II. The Effect of Organic Substances on Growth,
W73-12389 5C

ORGANIC MATTER
Aspects of the Biogeochemistry of Carbohydrates and Proteins in Aquatic Environments,
W73-12371 5C

The Monitoring of Organic Matter with Polyurethane Foam,
W73-12868 5A

Bacterial Content of Particulate Matter in Offshore Surface Waters,
W73-12912 5B

ORGANOLEAD COMPOUNDS
Biological Aspects of Lead: An Annotated Bibliography - Literature From 1950 through 1964. Parts I and II,
W73-12627 5C

OSOYOOS LAKE MACROINVERTEBRATES
Crustacean Plankton and the Eutrophication of Lakes in the Okanagan Valley, British Columbia,
W73-12624 5C

OUTLET WORKS
Outlet Works Stilling Basin for Tallahala Dam, Tallahala Creek, Mississippi; Hydraulic Model Investigation,
W73-12568 8B

OUTLETS
Numerical Thermal Plume Model for Vertical Outfalls in Shallow Water,
W73-12506 5B

OXIDATION
Selective Substrate Utilization by Marine Hydrocarbonoclastic Bacteria,
W73-12621 5B

Comparison of Waterflood Corrosion Detection and Monitoring Devices,
W73-12757 8G

OXIDATION LAGOON
Stabilization of Sewage Solids by the Channel Aeration Process,
W73-12502 5D

OXIDATION-REDUCTION POTENTIAL
The Influence of Vegetation on the Redox Profile in the Sediment of Grane Langso, A Danish Lobelia Lake,
W73-12379 5C

OXYGEN DEMAND
Wastewater Treatment Design Related to Biological Growth Supported by Activated Carbon,
W73-12494 5D

OXYGEN DIFFUSION CONTROL
Corrosion of Metals in Tropical Waters---Structural Ferrous Metals,
W73-12772 8G

OXYGEN SAG
The Effect of Longitudinal Dispersion on the Deoxygenation Rate in Polluted Streams,
W73-12714 5B

Swimming Performance of Young Atlantic Salmon (Salmo salar) as Affected by Reduced Ambient Oxygen Concentration,
W73-12897 5C

OXYGEN UPTAKE
Wastewater Treatment Design Related to Biological Growth Supported by Activated Carbon,
W73-12494 5D

OXYGENATION
Wastewater Treatment System,
W73-12455 5D

OYSTERS
The Effect of Floodwater on Oysters in Mobile Bay,
W73-12658 5C

PACIFIC HERRING
A Record of Pacific Herring (Clupea harengus Pallasi) Feeding on Juvenile Chinook Salmon (Oncorhynchus tshawytscha) in a British Columbia Estuary,
W73-12375 2L

PACIFIC OCEAN
Process-Form Variability of Multiclass Coasts: Baja California,
W73-12422 2L

PADDY FIELDS
Ecological Information on the Differences in the Number of Culex tritaeniorhynchus Larvae Among Paddy Fields (In Japanese),
W73-12829 3F

PALEOCLIMATOLOGY
Trials on Trends Through Clusters of Cirques,
W73-12732 2J

PAPER MILL WASTES
Influence of Land Reclamation and Waste Water from Paper Mill on Environment of 'Nori' (Porphyra Tenera) Culture Farm, (In Japanese),
W73-12639 5C

PARTICLE SIZE
Dynamics of a Falling Particle Zone,
W73-12603 2B

PARTICULATE MATTER
Bacterial Content of Particulate Matter in Offshore Surface Waters,
W73-12912 5B

PASTURES
Cenchrus Ciliaris--A Perennial Pasture Grass of Arid and Semi-Arid Areas,
W73-12790 4A

PATENTS
System for Removing Color From Paper Mill Liquid Waste,
W73-12445 5D

Water Decolorization,
W73-12446 5D

Method of Reducing Phenolic Waste,
W73-12447 5D

PATENTS

Vessel for the Removal of Oil on Water,
W73-12448 5G

Process and Apparatus for Removing Mercury from Waste Water,
W73-12449 5D

High-Purity Distilled Water Producing Apparatus,
W73-12450 3A

Activated Sludge Plant,
W73-12451 5D

Flotation Machine with Vertically Reciprocating Aerators,
W73-12452 5D

Heat-Exchanger for Desalting Sea Water,
W73-12453 3A

Waste Disposal Assembly,
W73-12454 5D

Wastewater Treatment System,
W73-12455 5D

Pollutant Recovery System,
W73-12456 5G

Circular Flotation System,
W73-12457 5D

Process of Treating and Purifying Sewage, Particularly of Sewage Contaminated with Detergents,
W73-12458 5D

Waste Water Purification by Breakpoint Chlorination and Carbon Adsorption,
W73-12459 5D

Cross-Flow Filtration Process for Removal of Total Organic Carbon and Phosphates from Aqueous Sewage Effluents,
W73-12460 5D

Waste Treatment System,
W73-12461 5D

Neutralization of Metal Containing Wastes,
W73-12462 5D

PATH OF POLLUTANTS

Lead Pollution: Records in Southern California Coastal Sediments,
W73-12589 5B

Long-Lived Pollutants in Sediments From the Laguna Atascosa National Wildlife Refuge, Texas,
W73-12595 5B

Heavy Metals in Estuaries and the Coastal Zone,
W73-12606 5B

The Effect of Longitudinal Dispersion on the Deoxygenation Rate in Polluted Streams,
W73-12714 5B

Flow of Microbially Fixed Nitrogen in a Model Ecosystem,
W73-12847 5B

Lithium Silicate Sedimentation Tracer for Shoal Deposit Studies,
W73-12862 5B

Mercury Distribution in Estuarine-Nearshore Environment,
W73-12920 5B

Salt Pollution of a Shallow Aquifer--Indianapolis, Indiana,
W73-12940 5B

PATUXENT ESTUARY (MD)

Observations of Intermediate and Small Scale Turbulent Water Motion in a Stratified Estuary (Parts I and II),
W73-12424 2L

PEACHES

Viruses Infecting Peaches in the Murrumbidgee Irrigation Areas of New South Wales,
W73-12981 3F

PEAT BOGS

Water Relations of Plants in Raised Sphagnum Peat Bogs,
W73-12838 2I

PEE DEE REGION (SOUTH CAROLINA)

Functional Water and Sewerage Plan and Program, Pee Dee Region, South Carolina.
W73-12365 5G

PENNSYLVANIA

Delaware Estuary, Pennsylvania, New Jersey, and Delaware, Long-Range Dredged Spoil Disposal Problem.
W73-12560 5E

Effect of School Water Fluoridation on Dental Caries: Final Results in Elk Lake, Pa., After 12 years,
W73-12647 5C

New Applications of Geophysical Methods to Ground-Water Problems in Pennsylvania,
W73-12783 2F

Simplification of the Blue Mountain Lichen Communities Near a Zinc Factory,
W73-12973 5C

PENSACOLA (FLORIDA)

The Design and Operation of Deep-Well Disposal System,
W73-12780 5E

PERCHLORIC ACID

Voltammetric Study of the Hydrogen Ion/Hydrogen Couple in Acetonitrile/Water Mixtures,
W73-12872 2K

PERCOLATION

Laboratory Investigations of the Transmission Capacity of Frozen and Thawed Soils Based on Data of the Valday Field Laboratory (Vnigl) (Laboratornyye issledovaniya vodopropusknoy sposobnosti merzlykh i talykh pochvo-gruntov (po materialam merzlothoy laboratorii VNIGL)),
W73-12437 2G

Factors Affecting the Percolation Test,
W73-12716 5B

PERCOLATION TESTS

Factors Affecting the Percolation Test,
W73-12716 5B

PERFORMANCE TESTS

Turbine Design and Performance for the Mersey-Forth Hydro Power Development,
W73-12486 8C

PERMEABILITY

Leaching Salty Soils,
W73-12789 2G

Nomograph for Hydraulic Conductivity and Intrinsic Permeability of Water-Soil System,
W73-12808 2G

PERSISTENCE

Dispersion, Dispersal, and Persistence of the Annual Intertidal Alga, Postelsia Palmeformis Ruprecht,
W73-12883 5C

PERSONNEL

WPCF Project Report: A State Certification Program Guide,
W73-12842 5G

PERU

Catastrophic Rock Slide, Mount Huascaran, North-Central Peru, May 31, 1970,
W73-12409 2J

Peruvian Fisheries: Conservation and Development.
W73-12689 6B

PEST CONTROL

Report to the Federal Working Group on Pest Management from the Task Group on Categorization of Pesticides Used by the Federal Government.
W73-12598 5G

PESTICIDE RESIDUES

Insecticide Residues in Water and Sediment from Cisterns on the U.S. and British Virgin Islands - 1970,
W73-12894 5B

PESTICIDES

Electrostatic Crop Spraying,
W73-12482 3F

Long-Lived Pollutants in Sediments From the Laguna Atascosa National Wildlife Refuge, Texas,
W73-12595 5B

Report to the Federal Working Group on Pest Management from the Task Group on Categorization of Pesticides Used by the Federal Government.
W73-12598 5G

pH-Sensitive Fluorogenic Spray Reagents: II. Quantitative Studies with Pesticides,
W73-12727 5A

Effects of Pesticides in Water--A Report to the States.
W73-12752 5G

PESTICIDES CATEGORIZATION

Report to the Federal Working Group on Pest Management from the Task Group on Categorization of Pesticides Used by the Federal Government.
W73-12598 5G

PETROLEUM HYDROCARBONS

Steam Distillation: A Simple Technique for Recovery of Petroleum Hydrocarbons from Tainted Fish,
W73-12849 5A

PHAEODACTYLUM TRICORNUTUM

Studies on the Growth of Phaeodactylum Tricornutum. II. The Effect of Organic Substances on Growth,
W73-12389 5C

PHAEOPHYTA
Correlated Light and Electron Microscope Studies on Brown Algae. II. Physode Production in Dictyota,
W73-12388 5C

Dispersion, Dispersal, and Persistence of the Annual Intertidal Alga, Postelsia Palmeformis Ruprecht,
W73-12883 5C

PHEASANTS
Effects of Stress on Pheasants Previously Given Polychlorinated Biphenyls,
W73-12995 5C

PHENOLIC PESTICIDES
Preparation and Properties of 3-Trifluoromethyl-4-Aminophenol,
W73-12622 5B

PHENOLS
Method of Reducing Phenolic Waste,
W73-12447 5D

Recondition and Reuse of Organically Contaminated Waste Sodium Chloride Brines,
W73-12521 5D

PHOSPHATES
Study of Utilization and Disposal of Lime Sludges Containing Phosphates,
W73-12501 5D

Influence of Different Moisture Regimes and Methods of Phosphate Application on Growth and Nutrient Absorption by Wheat (Triticum Aestivum L.),
W73-12539 3F

Phosphate Chemistry in Lake Sediments,
W73-12917 5C

PHOSPHOROUS
Effect of Compaction on Yield and Uptake of N, P and K by Maize (Zea mays L.),
W73-12660 3F

PHOSPHORUS
Nutrient Enrichment and Eutrophication of Lake Michigan,
W73-12377 5C

Phosphorus and Eutrophication,
W73-12394 5C

The Shagawa Lake Project: Lake Restoration by Nutrient Removal from Wastewater Effluent,
W73-12520 5D

Nutrients in Nebraska's Waters,
W73-12615 5B

The Characterization of Soluble Phosphorus Released by Limnetic Zooplankton,
W73-12904 5B

PHOSPHORUS REMOVAL
Phosphorus Removal and Plant Operation Studies at Fort Wayne, Indiana,
W73-12500 5D

PHOTO SULFOXIDATION
Photosulfoxidation of Hydrocarbons in the Liquid Phase,
W73-12833 2K

PHOTOSYNTHESIS
Extreme Water Stress and Photosynthetic Activity of the Desert Plant Artemisia Herba-Alba Asso,
W73-12785 2I

Physiology and Cytological Chemistry of Blue-Green Algae,
W73-12845 5C

Simulation Study of Phytoplankton Photosynthesis and Growth in the Fraser River Estuary,
W73-12919 5C

PHRÉATOPHYTES
A Comparison of Rates of Water Loss Through Transpiration of Several Southern New Mexico Phreatophyte Species,
W73-12497 2D

PHYSICAL CONTROL
Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. A. Physical Operations,
W73-12556 5D

PHYSICAL PROPERTIES
Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol III - Physical,
W73-12755 2H

PHYSIOCHEMICAL PROPERTIES
Preparation and Properties of 3-Trifluoromethyl-4-Aminophenol,
W73-12622 5B

PHYSIOGNOMY
The Physiognomy and Structure of the Benthic Macrophyte Communities on Rocky Shores in the Southwestern Archipelago of Finland (Seili Islands),
W73-12929 5A

PHYSIOLOGICAL ECOLOGY
Physiological Changes in Mytilus Edulis L. Induced by Temperature and Nutritive Stress,
W73-12878 5C

PHYSODES
Correlated Light and Electron Microscope Studies on Brown Algae. II. Physode Production in Dictyota,
W73-12388 5C

PHYTOKARST
Black Phytokarst From Hell, Cayman Islands, British West Indies,
W73-12593 2J

PHYTOPLANKTON
Mathematical modeling of Phytoplankton Populations,
W73-12399 5C

An Interdisciplinary Study of the Estuarine and Coastal Oceanography of Block Island Sound and Adjacent New York Coastal Waters,
W73-12629 5A

Artificial Reservoir Destratification Effects on Phytoplankton,
W73-12895 5C

A Mathematical Model of the Nutrient Dynamics of Phytoplankton in a Nitrate-Limited Environment,
W73-12915 5C

Simulation Study of Phytoplankton Photosynthesis and Growth in the Fraser River Estuary,
W73-12919 5C

Phytoplankton Algae: Nutrient Concentrations and Growth,
W73-12924 5C

PICLORAM ADSORPTION
Herbicide Contamination of Surface Runoff Waters,
W73-12511 5B

PIEDMONT FORESTS
Investigation of Mineral Nutrient Cycling in Upland Piedmont Forest,
W73-12700 4A

PIGMENTS
Laser Induced Fluorescence in Algae: A New Technique for Remote Detection,
W73-12841 5A

PIGOUVIAN TAX POLICY
Externalities, Welfare, And the Feasibility of Corrective Taxes,
W73-12694 6B

PINES (RED)
Water Potential in Red Pine: Soil Moisture, Evapotranspiration, Crown Position,
W73-12837 2I

PIPELINES
Cathodic Protection for Coated Steel Pipelines,
W73-12765 8G

Channel Erosion Surveys Along Proposed Taps Route, Alaska, July 1971,
W73-12957 2J

PITLESS ADAPTERS
Pitless Units and Adapters,
W73-12776 8G

PITTING
Comparison of Waterflood Corrosion Detection and Monitoring Devices,
W73-12757 8G

PIUTE SCULPIN
Contributions to the Life History of the Piute Sculpin in Sagehen Creek, California,
W73-12986 2I

PLANKTON
Some Effects of Artificial Fertilization on Enclosed Plankton Populations in Marion Lake, British Columbia,
W73-12384 5C

Selectivity of Towed-Net Samplers,
W73-12669 7B

Trace Element Trapping in Pteropod Tests,
W73-12937 5B

PLANNING
Systems Approach to Metropolitan and Regional Area Water and Sewer Planning,
W73-12351 6A

Identification of Water Resources Planning Problems in the Metropolitan Area of Greater San Antonio and Its Associated Counties,
W73-12354 6B

Comprehensive Public Water Supply Study for Schenectady County, New York.
W73-12358 3D

Summary Report: Comprehensive Sewerage Study for Schenectady County, New York.
W73-12359 5G

Interim Areawide Water and Sewer Plan: Bel-O-Mar area.
W73-12362 5G

Functional Water and Sewerage Plan and Program, Pee Dee Region, South Carolina.
W73-12365 5G

PLANNING

Town of Cairo Waste Water Report.
W73-12366 5D

The Lakefront Plan of Chicago.
W73-12367 4C

New Techniques for Participative Planning in Water Resources,
W73-12472 6B

Determination of Public Environmental Preferences in Water Resources Planning and Development,
W73-12706 6B

The Development of a Regional Systems Oriented Water Management Model: A Tool for Policy Analysis,
W73-12839 6A

Annual Literature Review: Administration, Systems Analysis,
W73-12840 5G

PLANT GROWTH

Studies on the Growth of Phaeodactylum Tricornutum. II. The Effect of Organic Substances on Growth,
W73-12389 5C

Effects of Light and Temperature on Algal Growth,
W73-12396 5C

The Effect of Soil Temperature on Plants Grown in Saline Soil,
W73-12797 2G

PLANT MORPHOLOGY

Physiology and Cytological Chemistry of Blue-Green Algae,
W73-12845 5C

PLANT PHYSIOLOGY

Sodium Relations in Desert Plants: 1. Cation Contents of Some Plant Species from the Mojave and Great Basin Deserts,
W73-12792 2I

Sodium Relations in Desert Plants: 2. Distribution of Cations in Plant Parts of Three Different Species of Atriplex,
W73-12793 2I

Physiology and Cytological Chemistry of Blue-Green Algae,
W73-12845 5C

Ecological Studies of Codium fragile in New England, USA,
W73-12918 5C

PLANT POPULATIONS

Some Effects of Artificial Fertilization on Enclosed Plankton Populations in Marion Lake, British Columbia,
W73-12384 5C

PLANT TISSUES

Welwitschia Mirabilis: Paradox of the Namib Desert,
W73-12796 2I

PLATINUM ELECTRODES

Voltammetric Study of the Hydrogen Ion/Hydrogen Couple in Acetonitrile/Water Mixtures,
W73-12872 2K

PLEISTOCENE EPOCH

Trials on Trends Through Clusters of Cirques,
W73-12732 2J

POLAND

Construction Costs of Water Supply and Sewage Networks in Poland--1961-1970,
W73-12703 6C

POLAROGRAPHIC DETERMINATION

Simultaneous Polarographic Determination of Iron (II) and Iron (III) in Coal Mine Waste Water,
W73-12976 5A

POLICIES

Anti-Pollution Policy and Cost Allocation: The Issues in Practice,
W73-12677 6B

POLIOVIRUS

Poliovirus in a Water Supply,
W73-12922 5B

POLITICAL ASPECTS

The Development of a Regional Systems Oriented Water Management Model: A Tool for Policy Analysis,
W73-12839 6A

POLLUTANT EFFECTS

Biological Aspects of Lead: An Annotated Bibliography - Literature From 1950 through 1964. Parts I and II,
W73-12627 5C

Some Short-Term Indicators of Sublethal Effects of Copper on Brook Trout, Salvelinus Fontinalis,
W73-12859 5C

POLLUTANT IDENTIFICATION

PCBs and DDT,
W73-12402 5C

Use of Coliphages as Indicators of Water pollution,
W73-12525 5A

Determination of Organic Substances in Industrial Effluents (Nektere moznosti stanoveni organickeho znecisteni odpadnich vod),
W73-12532 5A

Environmental Impact Study.
W73-12580 5G

Problems in the Analysis of Trace Metals,
W73-12608 5A

Factors Influencing Detection of Salmonellae in Rendered Animal By-Products,
W73-12619 5A

Biological Aspects of Lead: An Annotated Bibliography - Literature From 1950 through 1964. Parts I and II,
W73-12627 5C

Identification and Measurement of Environmental Pollutants. Symposium.
W73-12655 5A

Laser Induced Fluorescence in Algae: A New Technique for Remote Detection,
W73-12841 5A

Additional Studies for the Spectrophotometric Measurement of Iodine in Water.
W73-12851 5A

Characterization of Sweet Potato Processing Wastes,
W73-12852 5A

An Improved Method For Determining Organics by Activated Carbon Adsorption and Solvent Extraction - Pt. II (Test Method),
W73-12866 5A

The Monitoring of Organic Matter with Polyurethane Foam,
W73-12868 5A

Sodium Tungsten Bronze as a Potentiometric Indicating Electrode for Dissolved Oxygen in Aqueous solution,
W73-12873 5A

Instrumental and Numerical Considerations for On-Line Interpretation of High Resolution Mass Spectral Data,
W73-12874 2K

The Characterization of Soluble Phosphorus Released by Limnetic Zooplankton,
W73-12904 5B

Behavior of the Goldfish as an Early Warning System for the Presence of Pollutants in Water,
W73-12916 5A

Analytical Reviews 1973/Applications.
W73-12930 5A

Determination of Alkylbenzenesulfonate (ABS) in Bottom Sediment,
W73-12932 5A

POLLUTANTS

Analytical Reviews 1973/Applications.
W73-12930 5A

POLLUTION

Petroleum...40 Years of Research,
W73-12768 3E

POLLUTION ABATEMENT

The Niagara River Pollution Abatement Progress - 1971.
W73-12380 5G

Control of Oil and Other Hazardous Materials.
W73-12427 5G

Vessel for the Removal of Oil on Water,
W73-12448 5G

Waste Disposal Assembly,
W73-12454 5D

Pollutant Recovery System,
W73-12456 5G

Ontario Unhappy with Efforts of Industry to Halt Pollution,
W73-12538 5G

Environmental Care at Pulp Mills, Results and Expectations,
W73-12545 5D

Advanced Pollution Abatement Technology in the Pulp and Paper Industry.
W73-12552 5D

Environmental Impact Study.
W73-12580 5G

Problems of Environmental Economics.
W73-12675 6B

Environmental Policy Issues: Real and Fictitious,
W73-12676 6B

Anti-Pollution Policy and Cost Allocation: The Issues in Practice,
W73-12677 6B

Notes on Information and Administrative Costs in the Theory of Externalities,
W73-12678 6B

Environmental Quality Indicators and Social Indicators,
W73-12679 6B

Peter Bohm.
W73-12680 6B

The Set up of the Statistical System Within Which the Deterioration of the Human Environment will be Estimated,
W73-12681 6B

Some Limitations of Benefit-Cost Analysis in Respect of Programmes with Environmental Consequences,
W73-12682 6B

Evaluation of the Economic Effects of Anti-Pollution Public Policy,
W73-12684 6B

Economic Effects of Technology Changes in Relation to the Environment,
W73-12685 6B

The Role of Uniform Standards in International Environmental Management.
W73-12686 6B

Environmental Cost of Mining,
W73-12687 5G

Note on Charges and Bribes in the Long Run within Watersheds,
W73-12702 5G

A Study of the Economic Impact on the Steel Industry of the Costs of Meeting Federal Air and Water Pollution Abatement Requirements. Part I - Executive Summary.
W73-12707 5G

Impact of Costs Associated with New Environmental Standards Upon the Petroleum Refining Industry. Part I. The Impact of Environmental Control Costs.
W73-12708 5G

A Descriptive Analysis of the Bakery Products Industry Detailing Industry Trends and Characteristics Relevant to Economic Impact Analysis of Environmental Standards. Part II.
W73-12709 5G

A Study of the Impact of Pollution Standards and Charges on the Bakery Industry. Part III.
W73-12710 5G

POLLUTION CONTROL

Anti-Pollution Policy and Cost Allocation: The Issues in Practice,
W73-12677 6B

Environmental Quality Indicators and Social Indicators,
W73-12679 6B

Peter Bohm.
W73-12680 6B

The Set up of the Statistical System Within Which the Deterioration of the Human Environment will be Estimated,
W73-12681 6B

Some Limitations of Benefit-Cost Analysis in Respect of Programmes with Environmental Consequences,
W73-12682 6B

Evaluation of the Economic Effects of Anti-Pollution Public Policy,
W73-12684 6B

The Role of Uniform Standards in International Environmental Management.
W73-12686 6B

POLLUTION CONTROL TREATMENT

River Thames Antipollution: Boardmakers Install World's Largest Tidal River Surface Aerator.
W73-12548 5G

Aeration of the Thames.
W73-12549 5G

Large Surface Aerator Designed to Condition Board Mill Effluent.
W73-12550 5G

POLLUTION EFFECTS

Environmental Contamination by Toxic Metals,
W73-12605 5B

Arsenic and Cadmium in the Environment,
W73-12607 5C

POLLUTION TAXES (CHARGES)

Antipollution Policies, Their Nature and Their Impact on Corporate Profits,
W73-12695 5G

Note on Charges and Bribes in the Long Run within Watersheds,
W73-12702 5G

A Descriptive Analysis of the Bakery Products Industry Detailing Industry Trends and Characteristics Relevant to Economic Impact Analysis of Environmental Standards. Part II.
W73-12709 5G

A Study of the Impact of Pollution Standards and Charges on the Bakery Industry. Part III.
W73-12710 5G

POLLUTION TOLERANCE (FISH)

Effect of Heavy Metals on Fish,
W73-12611 5C

Effects of Metals on Fertilization and Development in Fish,
W73-12612 5C

POLYAROMATIC HYDROCARBONS

Polyaromatic Hydrocarbons in High-Boiling Petroleum Distillates. Isolation by Gel Permeation Chromatography and Identification by Fluorescence Spectrometry,
W73-12875 5A

POLYCHLORINATED BIPHENYLS

PCBs and DDT,
W73-12402 5C

Metabolic Effects of PCB (Polychlorinated Biphenyls) on the Brown Trout (Salmo trutta),
W73-12819 5C

DDT in Some New Zealand Marine and Freshwater Fauna,
W73-12925 5A

POLYELECTROLYTES

Viruses in Metropolitan Waters: Concentration by Polyelectrolytes, Freeze Concentration, and Ultrafiltration,
W73-12867 5F

POLYWATER

Soviet Study Shows Polywater Doesn't Exist.
W73-12540 1B

PORE SPACE

Leaching of Cement from a Concrete Pile Section by Groundwater Flow,
W73-12766 8F

PORES

Theory of Water Movement in Soils: 10. Cavities with Constant Flux,
W73-12600 2G

POSTELSIA PALMAEFORMIS

Dispersion, Dispersal, and Persistence of the Annual Intertidal Alga, Postelsia Palmeformis Ruprecht,
W73-12883 5C

POSTGLACIAL

Stratigraphy of Fossil Pigments as a Guide to the Postglacial History of Kirchner Marsh, Minnesota,
W73-12386 5C

POTABLE WATER

Health Standards for Metals in Drinking Water,
W73-12610 5G

Concentration of Fluorine in Potable Water in Bihar Plateau: A Preliminary Survey,
W73-12645 5A

Poliovirus in a Water Supply,
W73-12922 5B

Trisodium Nitrilotriacetate in Drinking Water: Metabolic and Renal Effects in Rats,
W73-12982 5C

Fluoridation or Fluoride Supplements: A Statement by the Nutrition Committee, Canadian Paediatric Society.
W73-12990 5G

POTASSIUM

Effect of Compaction on Yield and Uptake of N, P and K by Maize (Zea mays L.),
W73-12660 3F

POTATO TUBERS

Effects of Various Soil Moisture Regimes and Different Levels of Nitrogen and Different Spacings of the Quality of Potato Tubers (Solanum Tuberosum L.),
W73-12640 3F

POTENTIOMETRY

Sodium Tungsten Bronze as a Potentiometric Indicating Electrode for Dissolved Oxygen in Aqueous solution,
W73-12873 5A

POWERPLANTS

California Power Plant Siting Study: Volumes, I, II, and III.
W73-12574 5G

PRE-IMPOUNDMENT

Preimpoundment Study of West Point Lake, Georgia,
W73-12376 5C

PRECIPITATION (ATMOSPHERIC)

Climatology of Rainfall Probabilities for Oahu, Hawaii,
W73-12587 2B

Dynamics of a Falling Particle Zone,
W73-12603 2B

PRECIPITATION PARTICLES

Dynamics of a Falling Particle Zone,
W73-12603 2B

PRECIPITATION THEORY
Theory of Precipitation Effects on Dead Cylindrical Fuels,
W73-12381 2B

PREDATION
Predation by Rainbow Trout (Salmo Gairdneri): The Influence of Hungar, Prey Density and Prey Size,
W73-12836 8I

PRESIDIO (TEX)
Presidio Bolson, Trans-Pecos Texas and Adjacent Mexico: Geology of a Desert Basin Aquifer System,
W73-12585 2F

PRESTRESSING
Stresses in the Body and Foundations of Prestressed Dams,
W73-12475 8A

PRICING
The Effect of Price and Other Selected Variables on Water Consumption,
W73-12495 6B

PRIMARY PRODUCTIVITY
A Comparison of Liquid Scintillation and Geiger-Muller Estimates of Primary Productivity in an in Situ Experiment,
W73-12848 5A

An Evaluation of Liquid Scintillation Counting Techniques for Use in Aquatic Primary Production Studies,
W73-12907 5A

Membrane Filter Retention--A Source of Error in the C-14 Method of Measuring Primary Production,
W73-12908 5A

Simulation Study of Phytoplankton Photosynthesis and Growth in the Fraser River Estuary,
W73-12919 5C

Phytoplankton Algae: Nutrient Concentrations and Growth,
W73-12924 5C

Primary Productivity in a New and an Older California Reservoir,
W73-12998 8I

PRIORITIES
Heuristic Ranking and Prioritizing Under Subjective Conductions,
W73-12470 6B

PRODUCTIVITY
A Nitrogen Correction for Caloric Values,
W73-12383 5A

Nutrient Control in North San Francisco Bay,
W73-12398 5C

AGP Studies in the San Francisco Bay-Delta,
W73-12401 5C

PROFUNDAL FAUNA
The Profundal Fauna of Llyn Tegid, North Wales,
W73-12823 2I

PROJECT PLANNING
Heuristic Ranking and Prioritizing Under Subjective Conductions,
W73-12470 6B

A Proposed Streamflow Data Program for Connecticut,
W73-12748 4A

PROJECTS
Estuarine Navigation Projects.
W73-12575 8B

Maintenance of the Hudson River Channel, New York, Navigation Project, (Final Environmental Statement).
W73-12588 8B

Publications of Water Resources Investigations in Colorado and Selected Publications Pertaining to Colorado.
W73-12954 2A

PROTEIN
Protein Content of Brown Rice by Upland Polyethylene Film Mulching Culture, (In Japanese),
W73-12806 3F

PROTEINS
Aspects of the Biogeochemistry of Carbohydrates and Proteins in Aquatic Environments,
W73-12371 5C

PSEUDOMONADS
The Mechanisms of Nitrogen Assimilation in Pseudomonads,
W73-12881 5C

PSEUDOMONAS AERUGINOSA
ATP Pools in Pure and Mixed Cultures,
W73-12887 5A

PSYCHOLOGICAL ASPECTS
Measuring Public Responses to Vegetative Management,
W73-12408 4D

PTEROPODS
Trace Element Trapping in Pteropod Tests,
W73-12937 5B

PUBLIC FINANCING
Public Support of Private Water Resource Development in Agriculture--With Implications for Firm Growth,
W73-12698 4B

PUBLIC HEALTH
Heavy Metals in the Environment.
W73-12604 5B

Environmental Contamination by Toxic Metals,
W73-12605 5B

Health Standards for Metals in Drinking Water,
W73-12610 5G

The Role of Heavy Metals in Biology,
W73-12613 5C

Selenium in the Environment,
W73-12614 5C

PUBLIC PREFERENCES
Determination of Public Environmental Preferences in Water Resources Planning and Development,
W73-12706 6B

PUBLICATIONS
Sources of Data for Evaluation of Selected Geothermal Areas in Northern and Central Nevada,
W73-12947 4B

Reports for California by the Geological Survey Water Resources Division.
W73-12953 2A

Publications of Water Resources Investigations in Colorado and Selected Publications Pertaining to Colorado.
W73-12954 2A

PULP AND PAPER INDUSTRY
Effluent Treatment in Paper and Board Mills.
W73-12537 5D

Ontario Unhappy with Efforts of Industry to Halt Pollution,
W73-12538 5G

Environmental Care at Pulp Mills, Results and Expectations,
W73-12545 5D

Advanced Pollution Abatement Technology in the Pulp and Paper Industry.
W73-12552 5D

Water Pollution in the Pulp and Paper Industry. I. General and In-Plant Modifications,
W73-12553 5D

Water Pollution in the Pulp and Paper Industry. II. Testing Methods,
W73-12554 5A

Water Pollution in the Pulp and Paper Industry. III. Stream Response,
W73-12555 5C

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. A. Physical Operations,
W73-12556 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. B. Biological Systems,
W73-12557 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. C. Chemical Processes, General Observations, and Reports,
W73-12558 5D

PULP WASTES
Methods for Pulp and Paper Mill Sludge Utilization and Disposal,
W73-12519 5E

Methods for the Further Improvement of Spent Liquor Recovery in Lenzing,
W73-12524 5D

The Problem of Color Measurement for Pulp Manufacturing Effluents (Le probleme de la mesure de couleur des effluents de fabrication des pates),
W73-12526 5G

Pitfalls and Procedures in BOD Tests,
W73-12527 5A

Joint Treatment of Pulp Mill Effluents and Municipal Sewage.
W73-12528 5D

Detoxification of Kraft Pulp Mill Effluent by an Aerated Lagoon,
W73-12529 5D

Start-up of Biological Treatment Facilities for Pulp and Paper Mill Wastes,
W73-12531 5D

Determination of Organic Substances in Industrial Effluents (Nektere moznosti stanoveni organickeho znecisteni odpadnich vod),
W73-12532 5A

The TTC Test for the Control of Effluent Purification (Test TTC - Narzedziem kontroli procesu oczyszczania),
W73-12535 5D

Effluent Treatment in Paper and Board Mills.
W73-12537 5D

Waste Treatment Plant at ITT Rayonier Inc. Mill, Fernandina Beach, Florida.
W73-12541 5D

Rayonier Makes Major Breakthrough in Sulfite Pollution Control.
W73-12542 5D

Investigations on Waste Water Clarification with Activated Carbon (Untersuchungen zur Restabwasserklarung mit Aktivkohle),
W73-12543 5D

Practical Decolorization of Kraft Mill Effluents (Praktyka usuwania barwy sciekow posiarczanowych),
W73-12544 5D

Volatile Biochemical Oxygen-Consuming Materials Occurring in the Sulfite Process with Liquor Neutralization and Condensate Recovery: Theoretical Study, (Flyktiga biokemisk syreforbrukande amnens upptradande i sulfitprocessen vid lutneutralisering och kondensataterforing, Teoretisk undersokning),
W73-12546 5D

River Thames Antipollution: Boardmakers Install World's Largest Tidal River Surface Aerator.
W73-12548 5G

Aeration of the Thames.
W73-12549 5G

Large Surface Aerator Designed to Condition Board Mill Effluent.
W73-12550 5G

Microbiological Treatment Parameters of Bleached Kraft Pulp Mill Effluents,
W73-12551 5D

Determination of Melamine-Formaldehyde Resin in White Waters (Opredelenie soderzhaniya melamino-formaldegidnoi smoly v podsetochnykh vodakh),
W73-12672 5A

Selection of a Suitable System of Effluent Purification (O vybore ratsional'noi sistemy ochistki stochnykh vod),
W73-12673 5D

Investigation of the Environmental Factors Which Affect the Anaerobic Decomposition of Fibrous Sludge Beds on Stream Bottoms,
W73-12936 5B

PULPING

Advanced Pollution Abatement Technology in the Pulp and Paper Industry.
W73-12552 5D

PULPWOOD

Detoxification of Kraft Pulp Mill Effluent by an Aerated Lagoon,
W73-12529 5D

RADIATION

Radiation Regime of Lake Chelkar and Adjoining Regions (O radiatsionnom rezhime ozera Chelkar i prilegayushchey k nemu territorii),
W73-12724 2H

RADIOACTIVITY TECHNIQUES

A Comparison of Liquid Scintillation and Geiger-Muller Estimates of Primary Productivity in an in Situ Experiment,
W73-12848 5A

An Evaluation of Liquid Scintillation Counting Techniques for Use in Aquatic Primary Production Studies,
W73-12907 5A

Membrane Filter Retention--A Source of Error in the C-14 Method of Measuring Primary Production,
W73-12908 5A

RADIOCHEMICAL ANALYSIS

The Characterization of Soluble Phosphorus Released by Limnetic Zooplankton,
W73-12904 5B

Radiochemical Monitoring of Water After the Cannikin Event, Amchitka Island, Alaska, October, 1972,
W73-12945 5B

RADIOPHOSPHORUS

Effect of Time, Water Flow and pH on Centripetal Passage of Radiophosphorus Across Roots of Intact Plants,
W73-12991 5B

RAILROAD CONSTRUCTION

Fishes of the Big South Fork of the Cumberland River,
W73-12820 4C

RAIN

Extremes of Hydrometeors at Altitude for Mil-Std-210B: Supplement--Drop-Size Distributions,
W73-12599 2B

RAINBOW TROUT

Predation by Rainbow Trout (Salmo Gairdneri): The Influence of Hungar, Prey Density and Prey Size,
W73-12836 8I

Uptake of Mercury by Caged Rainbow Trout (Salmo Gairdneri) in the South Saskatchewan River,
W73-12857 5C

RAINDROP SIZES

Extremes of Hydrometeors at Altitude for Mil-Std-210B: Supplement--Drop-Size Distributions,
W73-12599 2B

RAINDROPS

Extremes of Hydrometeors at Altitude for Mil-Std-210B: Supplement--Drop-Size Distributions,
W73-12599 2B

RAINFALL

Resistance in Digitaria to Yellow Sugarcane Aphid, Siphaflava (Forbes) as Related to Temperature and Rainfall,
W73-12643 2I

Variability of Rainfall and Agricultural Efficiency of Sholapur District,
W73-12659 3F

Delayed Seed Dispersal and Rapid Germination as Survival Mechanisms of the Desert Plant Blepharis Persica (Burm.) Kuntze,
W73-12787 2I

RAINFALL INTENSITY

Extremes of Hydrometeors at Altitude for Mil-Std-210B: Supplement--Drop-Size Distributions,
W73-12599 2B

RAINFALL-RUNOFF RELATIONSHIPS

Hydrological Reservoir Design Using Basic Systems Theory Techniques,
W73-12471 8A

RATES

Boost A/D Rates with Staggered Operation,
W73-12893 7C

RAYCYCLE PROCESS

Waste Treatment Plant at ITT Rayonier Inc. Mill, Fernandina Beach, Florida.
W73-12541 5D

REAL-TIME COMPUTERS

Real-Time Interactive Instrumentation,
W73-12850 7A

REARING (FISH)

Rearing Channel Catfish Fingerlings Under Intensive Culture Conditions,
W73-12488 8I

RECHARGE

Analysis of Seepage Into Ground-Water System,
W73-12412 4B

Environmental Isotopes and Circulation in Aquifers Under Venice (Isotopes du Milieu et Circulations dans les Aquiferes du Sous-Sol Venitien),
W73-12419 2F

The Disposal of Wastewater Underground,
W73-12781 5E

RECREATION

Outdoor Recreation in the Baltimore Area.
W73-12360 6D

The Lakefront Plan of Chicago.
W73-12367 4C

Evaluation of Environmental Intangibles,
W73-12688 6B

RECREATION DEMAND

Outdoor Recreation in the Baltimore Area.
W73-12360 6D

RECYCLING

New Trends in Waste Water Treatment and Recycle,
W73-12533 5D

REFINERIES

Impact of Costs Associated with New Environmental Standards Upon the Petroleum Refining Industry. Part I. The Impact of Environmental Control Costs.
W73-12708 5G

REFUSE PILES

Control of Mine Drainage from Coal Mine Mineral Wastes - Phase II - Pollution Abatement and Monitoring,
W73-12516 5G

REGENERATION

The Selection of Eucalpts for Regeneration,
W73-12980 2I

REGIONAL ANALYSIS
Systems Approach to Metropolitan and Regional Area Water and Sewer Planning,
W73-12351 6A

Interim Areawide Water and Sewer Plan: Bel-O-Mar area.
W73-12362 5G

Functional Water and Sewerage Plan and Program, Pee Dee Region, South Carolina.
W73-12365 5G

A Study of Selected Aspects of Rural Water System Development in Mississippi,
W73-12492 6B

Economic and Related Impacts of Rural Water Systems in Mississippi,
W73-12493 6B

The Development of a Regional Systems Oriented Water Management Model: A Tool for Policy Analysis,
W73-12839 6A

REGIONAL DEVELOPMENT
A Study of Selected Aspects of Rural Water System Development in Mississippi,
W73-12492 6B

Multiple-Use Problems in the Great Lakes.
W73-12960 6B

Our Environmental Equilibrium in Nature,
W73-12961 6B

Toward a Regional Policy for the Great Lakes,
W73-12963 6B

The Planning Viewpoint,
W73-12964 6B

An Industrial Point of View-1970,
W73-12965 6B

REGRESSION ANALYSIS
The Effect of Price and Other Selected Variables on Water Consumption,
W73-12495 6B

Diamond-Bit Research Provides Basic Drilling Parameters,
W73-12764 8B

REMOTE SENSING
Evaluation of ERTS Data for Certain Oceanographic Uses,
W73-12429 7B

An Investigation of the Nitrate Problem in Runnels County, Texas,
W73-12514 5B

An Interdisciplinary Study of the Estuarine and Coastal Oceanography of Block Island Sound and Adjacent New York Coastal Waters,
W73-12629 5A

Water Quality Determinations in the Virgin Islands from ERTS-A Data,
W73-12630 5A

Laser Induced Fluorescence in Algae: A New Technique for Remote Detection,
W73-12841 5A

REPRODUCIBILITY
An Improved AA Microsampling System,
W73-12865 5A

REPTILES MORTALITY
Aeromonas-Induced Deaths Among Fish and Reptiles in an Eutrophic Inland Lake,
W73-12633 5C

RESERVOIR CAPACITY
Hydrological Reservoir Design Using Basic Systems Theory Techniques,
W73-12471 8A

Reservoir-Yield Estimation Procedures,
W73-12478 4A

RESERVOIR DESIGN
Hydrological Reservoir Design Using Basic Systems Theory Techniques,
W73-12471 8A

Reservoir-Yield Estimation Procedures,
W73-12478 4A

RESERVOIR STORAGE
Hydrological Reservoir Design Using Basic Systems Theory Techniques,
W73-12471 8A

Reservoir-Yield Estimation Procedures,
W73-12478 4A

RESERVOIR YIELD
Reservoir-Yield Estimation Procedures,
W73-12478 4A

RESERVOIRS
Preimpoundment Study of West Point Lake, Georgia,
W73-12376 5C

Selective Withdrawal from Man-Made Lakes, Hydraulic Laboratory Ivestigation,
W73-12569 4A

Biological Effects of Artificial Destratification and Aeration in Lakes and Reservoirs-Analysis and Bibliography,
W73-12625 5C

Some Effects of Evaporation Suppression on Reservoir Ecology,
W73-12869 5C

Artificial Reservoir Destratification Effects on Phytoplankton,
W73-12895 5C

RESIN COMPOUNDS
Sand Control - 3. Chemical Consolidation,
W73-12760 8G

RESINS
Determination of Melamine-Formaldehyde Resin in White Waters (Opredelenie soderzhaniya melamino-formaldegidnoi smoly v podsetochnykh vodakh),
W73-12672 5A

Application of Liquid Chromatography to Pollution Abatement Studies of Munition Wastes,
W73-12877 5A

RESISTIVITY
Cathodic Protection for Coated Steel Pipelines,
W73-12765 8G

New Applications of Geophysical Methods to Ground-Water Problems in Pennsylvania,
W73-12783 2F

RESPIRATION
Physiology and Cytological Chemistry of Blue-Green Algae,
W73-12845 5C

RETENTION
Membrane Filter Retention--A Source of Error in the C-14 Method of Measuring Primary Production,
W73-12908 5A

RETURN FLOW
Herbicide Contamination of Surface Runoff Waters,
W73-12511 5B

RETURN (MONETARY)
Public Support of Private Water Resource Development in Agriculture--With Implications for Firm Growth,
W73-12698 4B

REVIEWS
Critical Review of Currently Available Water Quality Models,
W73-12352 6A

Ground Water Pollution in the South Central States,
W73-12515 5B

Pitfalls and Procedures in BOD Tests,
W73-12527 5A

New Trends in Waste Water Treatment and Recycle,
W73-12533 5D

Effluent Treatment in Paper and Board Mills.
W73-12537 5D

Effective Hydraulic Roughness for Channels Having Bed Roughness Different from Bank Roughness; A State-Of-The-Art Report,
W73-12565 8B

Annual Literature Review: Administration, Systems Analysis,
W73-12840 5G

The Nitrogen Cycle in Sediment-Water Systems,
W73-12843 5C

Physiology and Cytological Chemistry of Blue-Green Algae,
W73-12845 5C

Carbon Cycle in Sediment-Water Systems,
W73-12846 5C

Total Mercury Analysis: Review and Critique,
W73-12885 5A

Phosphate Chemistry in Lake Sediments,
W73-12917 5C

Analytical Reviews 1973/Applications.
W73-12930 5A

REYNOLDS NUMBER
Heated Sensors for Flow Measurements,
W73-12618 7B

RICE
Effect of Varying Water Management Practices on the Growth, Yield and Nitrogen Uptake by High-Yielding Rice Varieties,
W73-12583 3F

RICE (BROWN)
Protein Content of Brown Rice by Upland Polyethylene Film Mulching Culture, (In Japanese),
W73-12806 3F

RICE-M FIELDS
Aqueous Iron-Sulfur Systems in Rice Field Soils of Louisiana,
W73-12385 3F

RIPARIAN WATER LOSS
A Comparison of Rates of Water Loss Through Transpiration of Several Southern New Mexico Phreatophyte Species,
W73-12497 2D

RIVER BASIN DEVELOPMENT
The Multipurpose Development of the River Rhone Valley,
W73-12467 4A

RIVER BASINS
Factors Producing the Outstanding Spring Flood of 1970 in Upper Don River Basins (Usloviya formirovaniya vydayushchegosya vesennego polovod'ya 1970 g. v basseynakh rek verkhnego Dona),
W73-12440 2E

Some Hydrophysical Characteristics of Soils in the Don River Basin to Kazanskaya Station (Nekotoryye vodno-fizicheskiye kharakteristiki pochv basseyna r. Dona do st-tsy Kazanskoy),
W73-12443 2G

RIVER FORECASTING
Stage-Discharge Relations on Big Lost River Within National Reactor Testing Station, Idaho,
W73-12750 4A

RIVER LUGG
The Growth, Reproduction and Food of the Roach Rutilus rutilus (L.), of the River Lugg, Herefordshire,
W73-12921 8I

RIVERS
Trace Metal Baseline Studies on the Murderkill and St Jones Rivers, Delaware Coastal Plain,
W73-12959 5B

ROACH
The Growth, Reproduction and Food of the Roach Rutilus rutilus (L.), of the River Lugg, Herefordshire,
W73-12921 8I

ROAD CONSTRUCTION
Sediment Resulting From Construction of an Interstate Highway in the Piedmont Area of North Carolina,
W73-12713 4C

ROCK CRAB
Biology of Rock Crab (Cancer Irroratus) in Northumberland Strait,
W73-12390 2L

ROCK DRILLABILITY
Well Logs can Indicate Formation Drillability,
W73-12769 8E

ROCK SLOPE STABILITY
Evaluation of Hydraulic Properties of Rock Masses Influenced by Major Heterogeneities,
W73-12468 8E

ROCK STRUCTURES
Wave Transmission Through Rock Structures; Hydraulic Model Investigation,
W73-12563 8B

ROCKFILL DAMS
Simplified Calculation of Embankment Deformations,
W73-12473 8D

ROCKSLIDES
Catastrophic Rock Slide, Mount Huascaran, North-Central Peru, May 31, 1970,
W73-12409 2J

ROCKY MOUNTAIN REGION
Report on Arkansas Valley Conduit for Southeastern Colorado Water Conservancy District, Four Corners Regional Commission and U.S. Bureau of Reclamation.
W73-12577 4A

ROOT DEPTH
The Effect of Irrigation Depth on Root Growth of Some Pasture Species,
W73-12834 3F

ROOT GROWTH
The Effect of Irrigation Depth on Root Growth of Some Pasture Species,
W73-12834 3F

ROOT NODULES
Effects of Water Stress on Nitrogen-Fixing Root Nodules: IV. Effects on Whole Plants of Vicia faba and Glycine max,
W73-12977 3F

ROOTS
Water Pathways in Higher Plants: II. Water Pathways in Roots,
W73-12651 2I

ROTATIONS
Hydrophysical Properties and Water Regime of Crimean Southern Chernozems in a Field Crop Rotation (Vodno-fizicheskiye svoystva i vodnyy rezhim yuzhnykh chernozemov Kryma v polevom sevooborote),
W73-12744 2G

Water Regime in a Crop Rotation on Chernozem Soils in Southeast Russia (Vodnyy rezhim v sevooborote na chernozemnykh pochvakh Yugo-Vostoka),
W73-12747 2G

Influence of Certain Rotations Upon Cotton Production in the San Joaquin Valley,
W73-12975 3F

ROUGHNESS (HYDRAULIC)
Extreme Roughness of Natural River Channel,
W73-12416 8B

Effective Hydraulic Roughness for Channels Having Bed Roughness Different from Bank Roughness; A State-Of-The-Art Report,
W73-12565 8B

RURAL AREAS
A Study of Selected Aspects of Rural Water System Development in Mississippi,
W73-12492 6B

Economic and Related Impacts of Rural Water Systems in Mississippi,
W73-12493 6B

RURAL SOCIOLOGY
A Study of Selected Aspects of Rural Water System Development in Mississippi,
W73-12492 6B

Economic and Related Impacts of Rural Water Systems in Mississippi,
W73-12493 6B

RYE GRASS
Mayak, Russian Wild Ryegrass,
W73-12974 4A

SABLEFISH CULTURE
Preliminary Study of Sablefish Culture, A Potential New Industry,
W73-12373 8I

SAGEBRUSH
Extreme Water Stress and Photosynthetic Activity of the Desert Plant Artemisia Herba-Alba Asso,
W73-12785 2I

SALINE SODIC SOILS
Effect of Quality of Well Waters on the Germination and Mineral Composition of Wheat on Saline-Sodic Soils Rich in Magnesium,
W73-12809 3C

SALINE SOILS
Leaching Salty Soils,
W73-12789 2G

Sodium-Affected Soils in the Jordan Valley,
W73-12795 2G

The Effect of Soil Temperature on Plants Grown in Saline Soil,
W73-12797 2G

SALINE WATER
Corrosion of Metals in Tropical Waters---Structural Ferrous Metals,
W73-12772 8G

SALINE WATER INTRUSION
Prediction of Unsteady Salinity Intrusion in Estuaries: Mathematical Model and User's Manual,
W73-12728 2L

SALINITY
Ground Water Pollution in the South Central States,
W73-12515 5B

The Effect of Floodwater on Oysters in Mobile Bay,
W73-12658 5C

Mineral Pollution in the Colorado River Basin,
W73-12715 5B

A Hydrographic Atlas of Larger North Carolina Sounds,
W73-12948 2L

SALMONELLA
Salmonella Contamination of Rivers and Sewages in Fukuyama City, (In Japanese),
W73-12648 5C

SALT BALANCE
Field Leaching by Sprinkler and Surface Irrigation During a Crop Season,
W73-12464 3F

SALT TOLERANCE
Sodium Relations in Desert Plants: 1. Cation Contents of Some Plant Species from the Mojave and Great Basin Deserts,
W73-12792 2I

Sodium Relations in Desert Plants: 2. Distribution of Cations in Plant Parts of Three Different Species of Atriplex,
W73-12793 2I

SALT-VERDE BASIN (ARIZ.)
Valuation of Timber, Forage and Water from National Forest Lands,
W73-12701 6B

SALTBUSH
The Interrelationships of the Vegetation Characters of Four Salt Desert Shrub Associations of Colorado Plateau,
W73-12791 3B

Sodium Relations in Desert Plants: 2. Distribution of Cations in Plant Parts of Three Different Species of Atriplex,
W73-12793 2I

SALTS
Wind-Driven Model for Evaporite Deposition in a Layered Sea,
W73-12594 2J

Experimental Investigation of Rock Weathering by Salts,
W73-12733 2K

Salt Pollution of a Shallow Aquifer--Indianapolis, Indiana,
W73-12940 5B

SAMPLE PREPARATION
Aromatic Hydroxylation as an Analytical Reaction,
W73-12853 5A

Determination of Lead in Petroleum Additives Using Atomic Absorption Spectrophotometry,
W73-12864 5A

SAMPLE PRESERVATION
Sugar-Coated Daphnia: A Preservation Technique for Cladocera,
W73-12910 5A

SAMPLERS
Selectivity of Towed-Net Samplers,
W73-12669 7B

SAMPLING
Variable Sampling Frequency - A New Adaptive Technique,
W73-12616 7B

The Zooplankton of the Gulf of Guinea,
W73-12623 5A

Corrosion Monitoring Method Reduces Effect of Variables in Analyzing Oil Field Waters,
W73-12767 8G

Auger Soil Sampler for Herbicide Residues,
W73-12794 2G

SAN FRANCISCO BAY-DELTA
Proceedings of Seminar on Eutrophication and Biostimulation.
W73-12391 5C

SAN JOAQUIN VALLEY
Influence of Certain Rotations Upon Cotton Production in the San Joaquin Valley,
W73-12975 3F

SANITARY ENGINEERING
Waste Disposal Assembly,
W73-12454 5D

Encourage Applied Research and Publish the Findings,
W73-12758 5G

SARDINES
The Size at Maturity and Breeding Seasons of Sardines in Southern Lake Tanganyika,
W73-12649 2H

SARGASSO SEA
Bacterial Content of Particulate Matter in Offshore Surface Waters,
W73-12912 5B

SATURATION (SOILS)
Nomograph for the Saturation Percentage of Soil,
W73-12807 2G

SCANDINAVIA
Settleable Matter in Waste Water. Scan-W7:72.
W73-12530 5A

SCENERY
The Visual Aspects of Resource Management,
W73-12407 4D

SCHENECTADY COUNTY (NEW YORK)
Summary Report: Comprehensive Sewerage Study for Schenectady County, New York.
W73-12359 5G

SCHENECTADY (NEW YORK)
Comprehensive Public Water Supply Study for Schenectady County, New York.
W73-12358 3D

SCINTILLATION COUNTING
An Evaluation of Liquid Scintillation Counting Techniques for Use in Aquatic Primary Production Studies,
W73-12907 5A

SCOTLAND (MEDWAY ESTUARY)
Fungi Colonizing Wood Submerged in the Medway Estuary,
W73-12825 2L

SCREEN WAVE ABSORBERS
Reflection Characteristics of Screen Wave Absorbers; Hydraulic Model Investigation,
W73-12561 8B

SCREENS
Reflection Characteristics of Screen Wave Absorbers; Hydraulic Model Investigation,
W73-12561 8B

Wave Damping Effects of Fibrous Screens; Hydraulic Model Investigation,
W73-12564 8B

SEA WATER
Heat-Exchanger for Desalting Sea Water,
W73-12453 3A

Particulate Manganese in Sea Water Stressing Regimes in Marine Anoxic Basins,
W73-12854 5A

Bacterial Content of Particulate Matter in Offshore Surface Waters,
W73-12912 5B

Thorium in Water and Algae from the Adriatic Sea,
W73-12927 5A

SECONDARY PRODUCTIVITY
The Utilization of Leaf Litter by Stream Detritivores,
W73-12882 5C

Annual Life Cycle and Production of the Chaetognath Sagitta elegans in Bedford Basin, Nova Scotia,
W73-12898 5B

Annual Production of a Stream Mayfly Population: A Comparison of Methods,
W73-12905 5B

SEDIMENT CONTROL
Sediment Resulting From Construction of an Interstate Highway in the Piedmont Area of North Carolina,
W73-12713 4C

Standards for Soil Erosion and Sediment Control in New Jersey.
W73-12956 2J

SEDIMENT TRANSPORT
Bureau of Reclamation Procedures for Predicting Sediment Yield,
W73-12479 2J

Forecasting Storm-Induced Beach Changes Along Virginia's Ocean Coast,
W73-12584 4A

Computer Models of Delta Growth Due to Sediment Input From Rivers and Longshore Transport,
W73-12592 2J

Sediment Resulting From Construction of an Interstate Highway in the Piedmont Area of North Carolina,
W73-12713 4C

SEDIMENT-WATER INTERFACES
Sediment-Water Nutrient Interchange in Eutrophic Lakes,
W73-12395 5C

The Nitrogen Cycle in Sediment-Water Systems,
W73-12843 5C

Carbon Cycle in Sediment-Water Systems,
W73-12846 5C

SEDIMENTARY STRUCTURES
Characteristic Physical and Biogenic Sedimentary Structures in Georgia Estuaries,
W73-12410 2L

SEDIMENTATION
Glacial Environment and Processes in Southeastern Alaska,
W73-12423 2C

Bureau of Reclamation Procedures for Predicting Sediment Yield,
W73-12479 2J

History of Sedimentation in Montsweag Bay,
W73-12740 2L

Lithium Silicate Sedimentation Tracer for Shoal Deposit Studies,
W73-12862 5B

SEDIMENTOLOGY
Biogeochemistry of Sediments of Delaware Bay,
W73-12739 2L

SEDIMENTS
The Sediments and History of Lake Butte des Morts, Wisconsin,
W73-12355 2J

Aspects of the Biogeochemistry of Carbohydrates and Proteins in Aquatic Environments,
W73-12371 5C

The Influence of Vegetation on the Redox Profile in the Sediment of Grane Langso, A Danish Lobelia Lake,
W73-12379 5C

Insecticide Residues in Water and Sediment from Cisterns on the U.S. and British Virgin Islands c 1970,
W73-12894 5B

SEEDS
Delayed Seed Dispersal and Rapid Germination as Survival Mechanisms of the Desert Plant Blepharis Persica (Burm.) Kuntze,
W73-12787 2I

SEEPAGE
Analysis of Seepage Into Ground-Water System,
W73-12412 4B

Hydrologic Models for Poorly Defined Drainage Areas,
W73-12496 2A

SEEPAGE CONTROL
Control of Underseepage by Relief Wells, Trotters, Mississippi; Appendix K: 1969 Pumping Tests,
W73-12597 8B

SEICHES
Long Wave Propagation in Idealized Estuary,
W73-12417 2L

SEISMIC PROPERTIES
Vertical Dynamic Response of Embeded Footings,
W73-12487 8C

SEISMIC STUDIES
Vertical Dynamic Response of Embeded Footings,
W73-12487 8C

SELECTIVE WITHDRAWAL
Selective Withdrawal from Man-Made Lakes, Hydraulic Laboratory Ivestigation,
W73-12569 4A

SELENIUM
Selenium in the Environment,
W73-12614 5C

Optimum Procedure for the Determination of Selenium in Biological Specimens Using Se-77m Neutron Activation,
W73-12876 5A

SEMI-INFINITE AQUIFERS
Waste Disposal Well Performance,
W73-12779 5E

SENSITIVITY
Sensitivity and Detectability Limits for Elemental Analysis by Proton-Induced X-Ray Fluorescence with a 3 Mv Van de Graaff,
W73-12935 5A

SENSORS
Water Quality Determinations in the Virgin Islands from ERTS-A Data,
W73-12630 5A

SEPARATION TECHNIQUES
Fluidized Bed Clarification as Applied to Wastewater Treatment,
W73-12505 5D

Steam Distillation: A Simple Technique for Recovery of Petroleum Hydrocarbons from Tainted Fish,
W73-12849 5A

Polyaromatic Hydrocarbons in High-Boiling Petroleum Distillates. Isolation by Gel Permeation Chromatography and Identification by Fluorescence Spectrometry,
W73-12875 5A

Determination of Uranium in Urine Specimens Following Their Separation Through Anion Exchange, (Bestimmung Des Urans in Urinproben Nach Dessen Abtrennung Durch Apionenaustausch),
W73-12931 5A

SEPTIC TANKS
Factors Affecting the Percolation Test,
W73-12716 5B

SETTLEMENT (STRUCTURAL)
Simplified Calculation of Embankment Deformations,
W73-12473 8D

SETTLING BASINS
Demostration of a Waste Disposal System for Livestock Waste,
W73-12517 5D

Sediment Resulting From Construction of an Interstate Highway in the Piedmont Area of North Carolina,
W73-12713 4C

SEVERN RIVER (ENGLAND)
Climatic Change and Arrested Meander Development on the River Severn,
W73-12737 4A

SEWAGE
Use of Coliphages as Indicators of Water pollution,
W73-12525 5A

Salmonella Contamination of Rivers and Sewages in Fukuyama City, (In Japanese),
W73-12648 5C

Construction Costs of Water Supply and Sewage Networks in Poland--1961-1970,
W73-12703 6C

SEWAGE EFFLUENTS
A Pilot Fish-Pond System for Utilization of Sewage Effluents, Humboldt Bay, Northern California,
W73-12434 5D

Disinfection of Sewage Effluents,
W73-12504 5D

SEWAGE SLUDGE
Characterization of Chemical Sludges,
W73-12871 5A

Land Disposal of Liquid Sewage Sludge: I. The Effect on Yield, in Vivo Digestibility, and Chemical Composition of Coastal Bermudagrass (Cynodon dactylon L. Pers.),
W73-12914 5D

SEWAGE TREATMENT
Activated Sludge Plant,
W73-12451 5D

Waste Disposal Assembly,
W73-12454 5D

Cross-Flow Filtration Process for Removal of Total Organic Carbon and Phosphates from Aqueous Sewage Effluents,
W73-12460 5D

Joint Treatment of Pulp Mill Effluents and Municipal Sewage.
W73-12528 5D

SEWERAGE
Summary Report: Comprehensive Sewerage Study for Schenectady County, New York.
W73-12359 5G

Interim Areawide Water and Sewer Plan: Bel-O-Mar area.
W73-12362 5G

Kay County, Oklahoma, Water and Sewerage Comprehensive Plan.
W73-12364 5G

Functional Water and Sewerage Plan and Program, Pee Dee Region, South Carolina.
W73-12365 5G

Town of Cairo Waste Water Report.
W73-12366 5D

Regional Utilities Study: Sewerage Volume of Technical Appendix.
W73-12369 5D

Poliovirus in a Water Supply,
W73-12922 5B

SEWERS
Systems Approach to Metropolitan and Regional Area Water and Sewer Planning,
W73-12351 6A

Regional Sewer System, Planning and Cost Estimation Model,
W73-12357 5G

SHAD (AMERICAN)
Water Temperature and the Migrations of American Shad,
W73-12666 2I

SHAGAWA LAKE (MINN)
The Shagawa Lake Project: Lake Restoration by Nutrient Removal from Wastewater Effluent,
W73-12520 5D

SHALLOW WATER
The Association of Amphipods in the Shallow-Water Sand Habitat of Strangford Lough, Co. Down,
W73-12879 5A

SHEAR MODULUS
Time Effects on Dynamic Shear Modulus of Clays,
W73-12477 2G

SHELLS
Trace Element Trapping in Pteropod Tests,
W73-12937 5B

SHINERS (YELLOWFIN)
The Influence of Organic Drift on the Food Habits and Life History of the Yellowfin Shiner, Notropis Lutipinnis (Jordan and Brayton),
W73-12844 2I

SHIP MODELS
Sea-Land Navigation Studies; Hydraulic Model Investigation,
W73-12567 8B

SHOALS
Delaware Estuary, Pennsylvania, New Jersey, and Delaware, Long-Range Dredged Spoil Disposal Problem.
W73-12560 5E

Effects of Proposed Dock Expansion at Newport News on Tides, Currents, and Shoaling; Hydraulic Model Investigation,
W73-12566 8B

SHOALS

Shoaling Conditions, St. Louis Harbor, Mississippi River; Hydraulic Model Investigation,
W73-12570 8B

Navigation Channel Improvement, Gastineau Channel, Alaska; Hydraulic Model Investigation,
W73-12571 8A

Lithium Silicate Sedimentation Tracer for Shoal Deposit Studies,
W73-12862 5B

SHRIMP

A Cage for Exposing Aquatic Animals to Bottom Sediments,
W73-12372 2L

SHRUBS

The Interrelationships of the Vegetation Characters of Four Salt Desert Shrub Associations of Colorado Plateau,
W73-12791 3B

SILICA

Nutrient Enrichment and Eutrophication of Lake Michigan,
W73-12377 5C

Silica In Thermal and Cold Waters (Kremnezem v termal'nykh i kholodnykh vodakh),
W73-12751 2K

Soluble Silica and Fluoride in Some Surface and Ground Waters of Mysore State,
W73-12969 2K

SILICATES

Soviet Study Shows Polywater Doesn't Exist.
W73-12540 1B

SIMULATION

Simulations of Meteorological Variations Over Arctic Coastal Tundra Under Various Physical Interface Conditions,
W73-12983 2B

SIMULATION ANALYSIS

Critical Review of Currently Available Water Quality Models,
W73-12352 6A

Computer Models of Delta Growth Due to Sediment Input From Rivers and Longshore Transport,
W73-12592 2J

The Development of a Regional Systems Oriented Water Management Model: A Tool for Policy Analysis,
W73-12839 6A

SKAHA LAKE

Crustacean Plankton and the Eutrophication of Lakes in the Okanagan Valley, British Columbia,
W73-12624 5C

SLABS

Strength Analysis of Corner Column-Slab Connections,
W73-12465 8A

SLOPE PROTECTION

Stone and Woodchip Mulches for Erosion Control on Construction Sites,
W73-12463 4D

SLOPE STABILIZATION

Stone and Woodchip Mulches for Erosion Control on Construction Sites,
W73-12463 4D

SLOPES

Terracettes: A Suggested Classification,
W73-12731 2J

SLOPING LAND

Application of Acrylic Plastic Tension Lysimeters to Sloping Land,
W73-12638 2G

SLUDGE BLANKET

Fluidized Bed Clarification as Applied to Wastewater Treatment,
W73-12505 5D

SLUDGE BULKING

Phosphorus Removal and Plant Operation Studies at Fort Wayne, Indiana,
W73-12500 5D

SLUDGE DIGESTION

Stabilization of Sewage Solids by the Channel Aeration Process,
W73-12502 5D

SLUDGE DISPOSAL

Study of Utilization and Disposal of Lime Sludges Containing Phosphates,
W73-12501 5D

Stabilization of Sewage Solids by the Channel Aeration Process,
W73-12502 5D

Methods for Pulp and Paper Mill Sludge Utilization and Disposal,
W73-12519 5E

Land Disposal of Liquid Sewage Sludge: I. The Effect on Yield, in Vivo Digestibility, and Chemical Composition of Coastal Bermudagrass (Cynodon dactylon L. Pers.),
W73-12914 5D

SLUDGE TREATMENT

An Efficient Method of Dewatering Effluent Sediments (Effektivnyi Sposob Obezvozhivaniya Osadkov Stochnikh Vod),
W73-12674 5E

SLURRY PONDS

Control of Mine Drainage from Coal Mine Mineral Wastes - Phase II - Pollution Abatement and Monitoring,
W73-12516 5G

SMALL WATERSHEDS

Results of a Study of Water Regime of Soils on Small Watersheds in the Don River Basin (Rezul'taty izucheniya vodnogo rezhima pochv malykh vodosborov v basseyne r. Dona),
W73-12441 2G

Preliminary Flood-Frequency Relations for Small Streams in Georgia,
W73-12946 4A

SNOW

Tritium and Deuterium Content of the Snow in Groenland,
W73-12418 5B

Green Snow and Ice From the Antarctica,
W73-12644 2I

Trials on Trends Through Clusters of Cirques,
W73-12732 2J

Estimating Snow-Water Equivalent from Point-Density Measurements of Forest Stands,
W73-12827 4A

SNOW COVER

Snow Cover of the Issyk-kul' Depression and Its Alpine Environment (Snezhnyy pokrov Issyk-Kul'skoy kotloviny i yeye vysokogornogo obramleniya),
W73-12726 2C

SNOWFALL

Tritium and Deuterium Content of the Snow in Groenland,
W73-12418 5B

SNOWLINES

Trials on Trends Through Clusters of Cirques,
W73-12732 2J

SNOWMELT

Investigation of Thermal Properties of Soils in the Don River Basin for Estimation of Snowmelt Losses to Infiltration Into Frozen Soil (Issledovaniye teplovykh svoystv pochv basseyna r. Dona dlya otsenki poter' talykh vod na in fil'tratsiyu v merzluyu pochvu),
W73-12436 2G

Evaporation During a Flood Period Caused by Spring Snowmelt (Isparenive v period vesennego snegotayaniya i polovod'ya),
W73-12442 2D

SNOWPACKS

Snow Cover of the Issyk-kul' Depression and Its Alpine Environment (Snezhnyy pokrov Issyk-Kul'skoy kotloviny i yeye vysokogornogo obramleniya),
W73-12726 2C

SOCIAL CHANGE

Economic and Related Impacts of Rural Water Systems in Mississippi,
W73-12493 6B

SOCIAL INDICATORS

Environmental Quality Indicators and Social Indicators,
W73-12679 6B

SOCIAL VALUES

Water Resource Decison Making--How Effective is the Public Input,
W73-12693 6B

Determination of Public Environmental Preferences in Water Resources Planning and Development,
W73-12706 6B

SOCKEYE SALMON

The Effects of Sublethal Concentrations of Whole Bleached Kraftmill Effluent on the Growth and Food Conversion Efficiency of Underyearling Sockeye Salmon (Oncorhynchus nerka),
W73-12913 5C

SODIUM

Sodium Relations in Desert Plants: 1. Cation Contents of Some Plant Species from the Mojave and Great Basin Deserts,
W73-12792 2I

Sodium Relations in Desert Plants: 2. Distribution of Cations in Plant Parts of Three Different Species of Atriplex,
W73-12793 2I

SODIUM CHLORIDE

Recondition and Reuse of Organically Contaminated Waste Sodium Chloride Brines,
W73-12521 5D

SOIL ANALYSIS
Auger Soil Sampler for Herbicide Residues,
W73-12794 2G

SOIL CONSERVATION
Economics in Soil and Water Conservation,
W73-12691 3F

Cenchrus Ciliaris--A Perennial Pasture Grass of Arid and Semi-Arid Areas,
W73-12790 4A

SOIL DISPOSAL FIELDS
Water Quality Hydrology of Lands Receiving Farm Animal Wastes,
W73-12353 5B

SOIL DYNAMICS
Time Effects on Dynamic Shear Modulus of Clays,
W73-12477 2G

Vertical Dynamic Response of Embeded Footings,
W73-12487 8C

SOIL EROSION
Standards for Soil Erosion and Sediment Control in New Jersey.
W73-12956 2J

SOIL EXTRACTS
Determination of Ammonium in Soil Extracts and Water Samples by an Ammonia Electrode,
W73-12939 2G

SOIL MOISTURE
Problems in the Production of a Spring Flood (Voprosy formirovaniya vesennego polovod-'ya).
W73-12435 4A

Results of a Study of Water Regime of Soils on Small Watersheds in the Don River Basin (Rezul'taty izucheniya vodnogo rezhima pochv malykh vodosborov v basseyne r. Dona),
W73-12441 2G

Methods of Determining Soil Moisture Storage in Winter (K metodike opredeleniya vlagozapasov pochvy v zimniy period goda),
W73-12444 2G

Effects of Air Gaps and Saturated Voids on Accuracy of Neutron Moisture Measurements,
W73-12636 2G

Effects of Various Soil Moisture Regimes and Different Levels of Nitrogen and Different Spacings of the Quality of Potato Tubers (Solanum Tuberosum L.),
W73-12640 3F

Characteristics of Water Migration in a Thick Leached Chernozem (Osobennosti dvizheniya vody v vyshchelochennom moshchnom chernozeme),
W73-12743 2G

Water Regime in a Crop Rotation on Chernozem Soils in Southeast Russia (Vodnyy rezhim v sevooborote na chernozemnykh pochvakh Yugo-Vostoka),
W73-12747 2G

Delayed Seed Dispersal and Rapid Germination as Survival Mechanisms of the Desert Plant Blepharis Persica (Burm.) Kuntze,
W73-12787 2I

Auger Soil Sampler for Herbicide Residues,
W73-12794 2G

Effect of Level of Soil Moisture on Nitrogen Mineralization and Nitrification During Incubation of East Pakistan Tea Soils,
W73-12799 3F

Effect of Soil Moisture on the Growth of Macrophomina Phaseoli, Sclerotium Rolfsii and Fausarium Solani in Soil,
W73-12831 3F

Water Potential in Red Pine: Soil Moisture, Evapotranspiration, Crown Position,
W73-12837 2I

SOIL PHYSICAL PROPERTIES
Some Hydrophysical Characteristics of Soils in the Don River Basin to Kazanskaya Station (Nekotoryye vodno-fizicheskiye kharakteristiki pochv basseyna r. Dona do st-tsy Kazanskoy),
W73-12443 2G

Hydrophysical Properties and Water Regime of Crimean Southern Chernozems in a Field Crop Rotation (Vodno-fizicheskiye svoystva i vodnyy rezhim yuzhnykh chernozemov Kryma v polevom sevooborote),
W73-12744 2G

SOIL PHYSICS
Characteristics of Water Migration in a Thick Leached Chernozem (Osobennosti dvizheniya vody v vyshchelochennom moshchnom chernozeme),
W73-12743 2G

SOIL TEMPERATURE
The Effect of Soil Temperature on Plants Grown in Saline Soil,
W73-12797 2G

SOIL TESTS
Time Effects on Dynamic Shear Modulus of Clays,
W73-12477 2G

SOIL TREATMENT
Methods for Pulp and Paper Mill Sludge Utilization and Disposal,
W73-12519 5E

Significance of Heating Agricultural Soils,
W73-12802 3F

SOIL TYPES
Sodium-Affected Soils in the Jordan Valley,
W73-12795 2G

SOIL WATER
Diurnal and Seasonal Effects of Environment on Plant Water Relations and Fruit Diameter of Citrus,
W73-12805 3F

Nomograph for the Saturation Percentage of Soil,
W73-12807 2G

SOIL WATER MOVEMENT
Theory of Water Movement in Soils: 10. Cavities with Constant Flux,
W73-12600 2G

Characteristics of Water Migration in a Thick Leached Chernozem (Osobennosti dvizheniya vody v vyshchelochennom moshchnom chernozeme),
W73-12743 2G

Water Regime in a Crop Rotation on Chernozem Soils in Southeast Russia (Vodnyy rezhim v sevooborote na chernozemnykh pochvakh Yugo-Vostoka),
W73-12747 2G

SOIL-WATER-PLANT RELATIONSHIPS
Water Regime in a Crop Rotation on Chernozem Soils in Southeast Russia (Vodnyy rezhim v sevooborote na chernozemnykh pochvakh Yugo-Vostoka),
W73-12747

Extreme Water Stress and Photosynthetic Activity of the Desert Plant Artemisia Herba-Alba Asso,
W73-12785 2I

SOIL-WATER STRESS
Germination of Wheat as Affected by Soil Water Stress,
W73-12884 3F

SOIL-WATER SYSTEM
Nomograph for Hydraulic Conductivity and Intrinsic Permeability of Water-Soil System,
W73-12808 2G

SOILS
Problems in the Production of a Spring Flood (Voprosy formirovaniya vesennego polovod-'ya).
W73-12435 4A

Investigation of Thermal Properties of Soils in the Don River Basin for Estimation of Snow-melt Losses to Infiltration Into Frozen Soil (Issledovaniye teplovykh svoystv pochv basseyna r. Dona dlya otsenki poter' talykh vod na in fil'tratsiyu v merzluyu pochvu),
W73-12436 2G

Some Hydrophysical Characteristics of Soils in the Don River Basin to Kazanskaya Station (Nekotoryye vodno-fizicheskiye kharakteristiki pochv basseyna r. Dona do st-tsy Kazanskoy),
W73-12443 2G

Erodibility of Hill Soils of Sutlej Catchment Area in Himachal Pradesh,
W73-12635 2J

Application of Acrylic Plastic Tension Lysimeters to Sloping Land,
W73-12638 2G

The Effect of Adsorbents on the Rate of Degradation of Herbicides Incubated with Soil,
W73-12656 5B

SOILS (LATERITE)
Influence of Moisture Regime on the Genesis of Laterite Soils in South Inida: II. Clay Composition and Mineralogy,
W73-12721 2G

SOLAR RADIATION
Optical Properties and Color of Lake Tahoe and Crater Lake,
W73-12926 5A

SOLIDS CONTACT PROCESSES
Fluidized Bed Clarification as Applied to Wastewater Treatment,
W73-12505 5D

SOLVENT EXTRACTIONS
An Improved Method For Determining Organics by Activated Carbon Adsorption and Solvent Extraction - Pt. II (Test Method),
W73-12866 5A

SONIC TRANSIT TIME LOG
Well Logs can Indicate Formation Drillability,
W73-12769 8E

SOUNDS
A Hydrographic Atlas of Larger North Carolina Sounds,
W73-12948 2L

SOUTH CAROLINA
Functional Water and Sewerage Plan and Program, Pee Dee Region, South Carolina.
W73-12365 5G

A Topologically Optimum River Sampling Plan for South Carolina,
W73-12498 5B

Determination of Public Environmental Preferences in Water Resources Planning and Development,
W73-12706 6B

Length-Weight Relationship and Condition Factors of Fishes From a South Carolina Reservoir Receiving Thermal Effluent,
W73-12774 5C

SOUTH CAROLINA (PRATERS CREEK)
The Influence of Organic Drift on the Food Habits and Life History of the Yellowfin Shiner, Notropis Lutipinnis (Jordan and Brayton),
W73-12844 2I

SOUTH-CENTRAL US
Ground Water Pollution in the South Central States,
W73-12515 5B

SOUTH SASKATCHEWAN RIVER
Uptake of Mercury by Caged Rainbow Trout (Salmo Gairdneri) in the South Saskatchewan River,
W73-12857 5C

SOYBEAN OIL
Treatment of Soybean Oil Soapstock to Reduce Pollution,
W73-12668 5D

SOYBEANS
Effects of Water Stress on Nitrogen-Fixing Root Nodules: IV. Effects on Whole Plants of Vicia faba and Glycine max,
W73-12977 3F

SPAIN (MURCIA)
Determination of Exchangeable Cations in Calcareous Soils,
W73-12786 2G

SPARTINA-M DIEBACK
Bacteria of Muds Colonized by Spartina Townsendii and their Possible Role in Spartina Die-Back,
W73-12705 2L

SPATIAL DISTRIBUTION
Community Structure of the Benthos in Scottish Sea-Lochs. II. Spatial Pattern,
W73-12855 5C

SPAWNING
Investigations on American Shad in the St. Johns River,
W73-12370 2H

SPECIATION
The Association of Amphipods in the Shallow-Water Sand Habitat of Strangford Lough, Co. Down,
W73-12879 5A

Description and Ecology of Hyaiella Texana N. Sp. (Crustacea: Amphipoda) from the Edwards Plateau of Texas,
W73-12900 2I

Some Marine Diatoms from the Galapagos Islands,
W73-12902 2I

SPECIES DIVERSITY
The Zooplankton of the Gulf of Guinea,
W73-12623 5A

SPECIES LEAF SURFACE AREA
A Comparison of Rates of Water Loss Through Transpiration of Several Southern New Mexico Phreatophyte Species,
W73-12497 2D

SPECTROPHOTOMETRY
Additional Studies for the Spectrophotometric Measurement of Iodine in Water.
W73-12851 5A

Spectrophotometric Determination of Ammonia,
W73-12886 5A

SPILLWAYS
Spillway for Oakley Dam, Sangamon River, Illinois-Appendix A: Type 2 (Revised) Spillway,
W73-12582 8A

SPOIL BANKS
Delaware Estuary, Pennsylvania, New Jersey, and Delaware, Long-Range Dredged Spoil Disposal Problem.
W73-12560 5E

Disposal of Dredge Spoil; Problem Identification and Assessment and Research Program Development,
W73-12573 4A

SPRAYING
Electrostatic Crop Spraying,
W73-12482 3F

SPRING
Problems in the Production of a Spring Flood (Voprosy formirovaniya vesennego polovod-'ya).
W73-12435 4A

Factors Producing the Outstanding Spring Flood of 1970 in Upper Don River Basins (Usloviya formirovaniya vydayushchegosya vesennego polovod'ya 1970 g. v basseynakh rek verkhnego Dona),
W73-12440 2E

Evaporation During a Flood Period Caused by Spring Snowmelt (Ispareniye v period vesennego snegotayaniya i polovod'ya),
W73-12442 2D

SPRINKLER IRRIGATION
Field Leaching by Sprinkler and Surface Irrigation During a Crop Season,
W73-12464 3F

Improvements in Moving Sprinkler Irrigation Systems for Conservation of Water,
W73-12507 3F

SPRUCE FIR
Estimating Snow-Water Equivalent from Point-Density Measurements of Forest Stands,
W73-12827 4A

ST. CLAIR RIVER (MICH)
Effects of Submerged Sills in the St. Clair River; Hydraulic Model Investigation,
W73-12572 8B

ST. JONES RIVER (DEL)
Trace Metal Baseline Studies on the Murderkill and St Jones Rivers, Delaware Coastal Plain,
W73-12959 5B

ST. LAWRENCE SEAWAY
Toward a Regional Policy for the Great Lakes,
W73-12963 6B

ST. LOUS HARBOR (MO)
Shoaling Conditions, St. Louis Harbor, Mississippi River; Hydraulic Model Investigation,
W73-12570 8B

STABLE ISOTOPES
An Investigation of the Nitrate Problem in Runnels County, Texas,
W73-12514 5B

STAGE-DISCHARGE RELATIONS
Extreme Roughness of Natural River Channel,
W73-12416 8B

Stage-Discharge Relations on Big Lost River Within National Reactor Testing Station, Idaho,
W73-12750 4A

STANDARDS
The Role of Uniform Standards in International Environmental Management.
W73-12686 6B

STANDING CROPS
Annual Production of a Stream Mayfly Population: A Comparison of Methods,
W73-12905 5B

STATISTICAL METHODS
The Set up of the Statistical System Within Which the Deterioration of the Human Environment will be Estimated,
W73-12681 6B

Trials on Trends Through Clusters of Cirques,
W73-12732 2J

STEAM DISTIALLATION
Steam Distillation: A Simple Technique for Recovery of Petroleum Hydrocarbons from Tainted Fish,
W73-12849 5A

STEEL INDUSTRY
A Study of the Economic Impact on the Steel Industry of the Costs of Meeting Federal Air and Water Pollution Abatement Requirements. Part I - Executive Summary.
W73-12707 5G

STEEL STRUCTURES
High Strength Bolted Galvanized Joints,
W73-12489 8G

STILLING BASINS
Outlet Works Stilling Basin for Tallahala Dam, Tallahala Creek, Mississippi; Hydraulic Model Investigation,
W73-12568 8B

STIMULATION
Electrical Stimulation of Microbial Waste Treatment,
W73-12503 5D

STOCKYARDS
Demostration of a Waste Disposal System for Livestock Waste,
W73-12517 5D

STORAGE COEFFICIENT
Flow to Wells Near Streams in the Presence of Delayed Yield From Storage and Analysis of Pumping Test Data,
W73-12943 4B

STORM CLOUDS
Water Content in Convective Storm Clouds,
W73-12536 2B

STORMS
Forecasting Storm-Induced Beach Changes Along Virginia's Ocean Coast,
W73-12584 4A

STRAHLERS LAW
Some Examples of Drainage Component Analysis,
W73-12734 4A

STRATIFIED FLOW
Observations of Intermediate and Small Scale Turbulent Water Motion in a Stratified Estuary (Parts I and II),
W73-12424 2L

Selective Withdrawal from Man-Made Lakes, Hydraulic Laboratory Ivestigation,
W73-12569 4A

STREAM CHANNELING
Effects of Stream Channeling on Wetlands in a Minnesota Watershed,
W73-12667 4A

STREAMFLOW
A Proposed Streamflow Data Program for Connecticut,
W73-12748 4A

Stage-Discharge Relations on Big Lost River Within National Reactor Testing Station, Idaho,
W73-12750 4A

STRESS ANALYSIS
Stresses in the Body and Foundations of Prestressed Dams,
W73-12475 8A

STRESS DISTRIBUTION
Stress Distribution Around a Tunnel Situated in a Layer Under the Action of Gravity,
W73-12490 8E

STRUCTURAL ANALYSIS
Tests of Selected Insulating Materials for Mass Concrete,
W73-12431 8F

Strength Analysis of Corner Column-Slab Connections,
W73-12465 8A

STRUCTURAL CONCRETE
Strength Analysis of Corner Column-Slab Connections,
W73-12465 8A

STRUCTURAL DESIGN
Guide for the Design of Aluminum Transmission Towers.
W73-12485 8C

STRUCTURAL STEEL
Welding of a Normalized High Strength Low Alloy Plate Steel of Structural Quality,
W73-12466 8G

High Strength Bolted Galvanized Joints,
W73-12489 8G

SUBMARINE CANYONS
Sea Floor Off Magdalena Delta and Santa Marta Area, Colombia,
W73-12591 2J

SUBMERGED SILLS
Effects of Submerged Sills in the St. Clair River; Hydraulic Model Investigation,
W73-12572 8B

SUBSTRATE UTILIZATION
The Mechanisms of Nitrogen Assimilation in Pseudomonads,
W73-12881 5C

A Relationship between Heterotrophic Utilization of Organic Acids and Bacterial Populations in West Blue Lake, Manitoba,
W73-12903 5C

SUBSURFACE DRAINAGE
Leaching of Cement from a Concrete Pile Section by Groundwater Flow,
W73-12766 8F

SUCCESSION
Some Effects of Artificial Fertilization on Enclosed Plankton Populations in Marion Lake, British Columbia,
W73-12384 5C

SUCROSE
Sugar-Coated Daphnia: A Preservation Technique for Cladocera,
W73-12910 5A

SUISUN BAY (CALIF.)
Mathematical modeling of Phytoplankton Populations,
W73-12399 5C

SULFATE SOILS
Morphology, Genesis, Occurrence and Agricultural Potential of Acid Sulphate Soils in Central Thailand,
W73-12818 2G

SULFER BACTERIA
Corrosion by the Sulphate-Reducing Bacteria,
W73-12756 5G

SULFITE LIQUORS
Waste Treatment Plant at ITT Rayonier Inc. Mill, Fernandina Beach, Florida.
W73-12541 5D

Volatile Biochemical Oxygen-Consuming Materials Occurring in the Sulfite Process with Liquor Neutralization and Condensate Recovery: Theoretical Study, (Flyktiga biokemisk syreforbrukande amnens upptradande i sulfitprocessen vid lutneutralisering och kondensataterforing, Teoretisk undersokning),
W73-12546 5D

SULFITE MILLS
Waste Treatment Plant at ITT Rayonier Inc. Mill, Fernandina Beach, Florida.
W73-12541 5D

SULFITE PULPING
Methods for the Further Improvement of Spent Liquor Recovery in Lenzing,
W73-12524 5D

Rayonier Makes Major Breakthrough in Sulfite Pollution Control.
W73-12542 5D

SURFACANTS
Micellar Solutions Stimulate Wells,
W73-12762 8B

SURFACE AERATION
Stabilization of Sewage Solids by the Channel Aeration Process,
W73-12502 5D

SURFACE-GROUNDWATER RELATIONSHIPS
An Approach to Hydrogeologic Investigations of River Alluvium by the Use of Computerized Data Processing Techniques,
W73-12942 2A

Flow to Wells Near Streams in the Presence of Delayed Yield From Storage and Analysis of Pumping Test Data,
W73-12943 4B

SURFACE IRRIGATION
Field Leaching by Sprinkler and Surface Irrigation During a Crop Season,
W73-12464 3F

SURFACE PITS
Problems of Groundwater Pollution by Brine,
W73-12770 5B

SURFACE WATERS
Hydrological Year-Book of Israel, 1970/71.
W73-12432 2A

Hydrologic Records for Lake County, Florida: 1971-72,
W73-12949 2E

SURFACTANTS
Bacterial Degradation of Detergent Compounds,
W73-12938 5B

SURVEYS
Biological Aspects of Lead: An Annotated Bibliography - Literature From 1950 through 1964. Parts I and II,
W73-12627 5C

Determination of Public Environmental Preferences in Water Resources Planning and Development,
W73-12706 6B

SUSPENDED SOLIDS
Waste Water Treatment in Commercial Fish Processing: Reducing Stick Water Loadings,
W73-12420 5D

Circular Flotation System,
W73-12457 5D

Waste Treatment System,
W73-12461 5D

Settleable Matter in Waste Water. Scan-W7:72.
W73-12530 5A

Stream-Velocity Effects on the Heavy-Metal Concentrations,
W73-12870 5B

SWEDEN
Environmental Care at Pulp Mills, Results and Expectations,
W73-12545 5D

SWEET POTATOES
Characterization of Sweet Potato Processing Wastes,
W73-12852 5A

SWIMMING
Swimming Performance of Young Atlantic Salmon (Salmo salar) as Affected by Reduced Ambient Oxygen Concentration,
W73-12897 5C

SYMPOSIUM (OREGON STATE UNIV)
Heavy Metals in the Environment.
W73-12604 5B

SYNCHRONOUS MACHINES
An Electric Conversion for Mechanical Hydraulic Governors of Water Wheel Turbines,
W73-12469 8C

SYSTEMATICS
The Association of Amphipods in the Shallow-Water Sand Habitat of Strangford Lough, Co. Down,
W73-12879 5A

Description and Ecology of Hyaiella Texana N. Sp. (Crustacea: Amphipoda) from the Edwards Plateau of Texas,
W73-12900 2I

SYSTEMS ANALYSIS
Systems Approach to Metropolitan and Regional Area Water and Sewer Planning,
W73-12351 6A

Annual Literature Review: Administration, Systems Analysis,
W73-12840 5G

TALLAHALA DAM (MISS)
Outlet Works Stilling Basin for Tallahala Dam, Tallahala Creek, Mississippi; Hydraulic Model Investigation,
W73-12568 8B

TANANA RIVER (ALAS)
Chena River Lakes Project, Alaska, Problems Relating to Channel Development, Erosion, and Bank and Levee Protection,
W73-12559 8B

TANNERY WASTES
Water Decolorization,
W73-12446 5D

TEMPERATURE
Effects of Light and Temperature on Algal Growth,
W73-12396 5C

Mortality Curves of Bluegills (Lepomis Macrochirus Rafinesque) Simultaneously Exposed to Temperature and Zinc Stress,
W73-12637 5C

Resistance in Digitaria to Yellow Sugarcane Aphid, Siphaflava (Forbes) as Related to Temperature and Rainfall,
W73-12643 2I

TENNESSEE
Hydraulics of Sheetlike Solution Cavities,
W73-12944 4B

TENNESSEE (CUMBERLAND RIVER)
Fishes of the Big South Fork of the Cumberland River,
W73-12820 4C

TENNESSEE RIVER
Mussels in the Unique Nickajack Dam Construction Site, Tennessee River, 1965,
W73-12800 2I

TENSIOMETERS
Evaluation of Tensiometers for Estimating Plant Water Stress in Citrus,
W73-12985 3F

TERRACETTES
Terracettes: A Suggested Classification,
W73-12731 2J

TERRAIN ANALYSIS
A Suggested New Approach to the Analysis of Drainage Basin Shapes,
W73-12729 4A

TERTIARY TREATMENT
Study of Utilization and Disposal of Lime Sludges Containing Phosphates,
W73-12501 5D

Tertiary Treatment of Combined Domestic and Industrial Wastes,
W73-12512 5D

The Shagawa Lake Project: Lake Restoration by Nutrient Removal from Wastewater Effluent,
W73-12520 5D

TESTING PROCEDURES
Water Pollution in the Pulp and Paper Industry. II. Testing Methods,
W73-12554 5A

TEXAS
Water Quality Hydrology of Lands Receiving Farm Animal Wastes,
W73-12353 5B

Identification of Water Resources Planning Problems in the Metropolitan Area of Greater San Antonio and Its Associated Counties,
W73-12354 6B

An Investigation of the Nitrate Problem in Runnels County, Texas,
W73-12514 5B

Presidio Bolson, Trans-Pecos Texas and Adjacent Mexico: Geology of a Desert Basin Aquifer System,
W73-12585 2F

Long-Lived Pollutants in Sediments From the Laguna Atascosa National Wildlife Refuge, Texas,
W73-12595 5B

Auger Soil Sampler for Herbicide Residues,
W73-12794 2G

Description and Ecology of Hyaiella Texana N. Sp. (Crustacea: Amphipoda) from the Edwards Plateau of Texas,
W73-12900 2I

THAILAND
Morphology, Genesis, Occurrence and Agricultural Potential of Acid Sulphate Soils in Central Thailand,
W73-12818 2G

THAMES RIVER (U.K.)
River Thames Antipollution: Boardmakers Install World's Largest Tidal River Surface Aerator.
W73-12548 5G

Aeration of the Thames.
W73-12549 5G

Large Surface Aerator Designed to Condition Board Mill Effluent.
W73-12550 5G

THAWING
Laboratory Investigations of the Transmission Capacity of Frozen and Thawed Soils Based on Data of the Valday Field Laboratory (Vnigl) (Laboratornyye issledovaniya vodopropusknoy sposobnosti merzlykh i talykh pochvo-gruntov (po materialam merzlothoy laboratorii VNIGL)),
W73-12437 2G

THEORETICAL ANALYSIS
Identification of the Limiting Nutrient and Specific Growth Rate,
W73-12861 5C

THERMAL CONDUCTIVITY
Heated Sensors for Flow Measurements,
W73-12618 7B

THERMAL DESTRATIFICATION
Artificial Reservoir Destratification Effects on Phytoplankton,
W73-12895 5C

THERMAL EFFLUENTS
Length-Weight Relationship and Condition Factors of Fishes From a South Carolina Reservoir Receiving Thermal Effluent,
W73-12774 5C

THERMAL EXPANSION
Tests of Selected Insulating Materials for Mass Concrete,
W73-12431 8F

THERMAL INSULATION
Tests of Selected Insulating Materials for Mass Concrete,
W73-12431 8F

THERMAL POLLUTION
Numerical Thermal Plume Model for Vertical Outfalls in Shallow Water,
W73-12506 5B

THERMAL PROPERTIES
Investigation of Thermal Properties of Soils in the Don River Basin for Estimation of Snowmelt Losses to Infiltration Into Frozen Soil (Issledovaniye teplovykh svoystv pochv basseyna r. Dona dlya otsenki poter' talykh vod na in fil'tratsiyu v merzluyu pochvu),
W73-12436 2G

THERMAL STRESS
Physiological Changes in Mytilus Edulis L. Induced by Temperature and Nutritive Stress,
W73-12878 5C

Effect of Incubation Temperature on the Macromolecular and Lipid Content of the Phytoflagellate Ochromonas danica,
W73-12896 5C

THERMAL WATER
Silica In Thermal and Cold Waters (Kremnezem v termal'nykh i kholodnykh vodakh),
W73-12751 2K

THIN LAYER CHROMATOGRAPHY
Polyaromatic Hydrocarbons in High-Boiling Petroleum Distillates. Isolation by Gel Permeation Chromatography and Identification by Fluorescence Spectrometry,
W73-12875 5A

THORIUM
Thorium in Water and Algae from the Adriatic Sea,
W73-12927 5A

TIDAL EFFECTS
The Computation of Tides and Currents in Estuaries and Canals,
W73-12428 2L

TIDAL WATERS
Estuarine Navigation Projects.
W73-12575 8B

TIDES
Long Wave Propagation in Idealized Estuary,
W73-12417 2L

Effects of Proposed Dock Expansion at Newport News on Tides, Currents, and Shoaling; Hydraulic Model Investigation,
W73-12566 8B

TISSUE
Optimum Procedure for the Determination of Selenium in Biological Specimens Using Se-77m Neutron Activation,
W73-12876 5A

TNT
Application of Liquid Chromatography to Pollution Abatement Studies of Munition Wastes,
W73-12877 5A

TOPOGRAPHY
Climatic Change and Arrested Meander Development on the River Severn,
W73-12737 4A

TOPOLOGICALLY OPTIMUM PLAN
A Topologically Optimum River Sampling Plan for South Carolina,
W73-12498 5B

TOXICITY
Detoxification of Kraft Pulp Mill Effluent by an Aerated Lagoon,
W73-12529 5D

Environmental Contamination by Toxic Metals,
W73-12605 5B

Some Short-Term Indicators of Sublethal Effects of Copper on Brook Trout, Salvelinus Fontinalis,
W73-12859 5C

Stream-Velocity Effects on the Heavy-Metal Concentrations,
W73-12870 5B

The Use of Fish as Sensors in Industrial Waste Lines to Prevent Fish Kills,
W73-12889 5C

The Reduction of Copper Toxicity in a Marine Copepod by Sediment Extract,
W73-12909 5C

TOXICOLOGICAL STUDIES
Mercury in Fish: Some Toxicological Considerations,
W73-12826 5C

TOXICOLOGY
Biological Aspects of Lead: An Annotated Bibliography - Literature From 1950 through 1964. Parts I and II,
W73-12627 5C

TRACE ELEMENTS
Problems in the Analysis of Trace Metals,
W73-12608 5A

Trace Element Trapping in Pteropod Tests,
W73-12937 5B

Trace Metal Baseline Studies on the Murderkill and St Jones Rivers, Delaware Coastal Plain,
W73-12959 5B

TRACERS
Prediction of Mixing Lengths for River Flow Gaging,
W73-12414 5B

Lithium Silicate Sedimentation Tracer for Shoal Deposit Studies,
W73-12862 5B

TRAINING
WPCF Project Report: A State Certification Program Guide,
W73-12842 5G

TRANS-ALASKA PIPELINE SYSTEM
Channel Erosion Surveys Along Proposed Taps Route, Alaska, July 1971,
W73-12957 2J

TRANSMISSION CAPACITY
Laboratory Investigations of the Transmission Capacity of Frozen and Thawed Soils Based on Data of the Valday Field Laboratory (Vnigl) (Laboratornyye issledovaniya vodopropusknoy sposobnosti merzlykh i talykh pochvo-gruntov (po materialam merzlothoy laboratorii VNIGL)),
W73-12437 2G

TRANSMISSION LINES
Energy Method for Computing the Amplitude of Vibration of Conductor Bundles Due to Wake Effect,
W73-12480 8C

TRANSMISSION TOWERS
Guide for the Design of Aluminum Transmission Towers.
W73-12485 8C

TRANSPIRATION
A Comparison of Rates of Water Loss Through Transpiration of Several Southern New Mexico Phreatophyte Species,
W73-12497 2D

Water Pathways in Higher Plants: III. The Transpiration Stream Within Leaves,
W73-12652 2I

TRANSPORT DEPLETION
Trace Element Trapping in Pteropod Tests,
W73-12937 5B

TRANSPORTATION
Survey of Water Transportation Potential to Reduce Congestion and Pollution in Washington, D.C. and Other Major Cities.
W73-12363 5G

TRAPNETS
Design of Trapnet with Interchangeable Parts for the Capture of Large and Small Fishes from Varying Depths,
W73-12899 8I

TRAWLING
Exploratory Bottom Trawling in Lake Victoria,
W73-12803 2H

TREARDDUR BAY (NORTH WALES)
Correlated Light and Electron Microscope Studies on Brown Algae. II. Physode Production in Dictyota,
W73-12388 5C

TREATMENT FACILITIES
Detoxification of Kraft Pulp Mill Effluent by an Aerated Lagoon,
W73-12529 5D

Start-up of Biological Treatment Facilities for Pulp and Paper Mill Wastes,
W73-12531 5D

Selecting Waste Water Aeration Equipment,
W73-12534 5D

Rayonier Makes Major Breakthrough in Sulfite Pollution Control.
W73-12542 5D

TRICLAD TURBELLARIAN
Extension of Range of the Triclad Turbellarian Phagocata Gracilis (Haldeman),
W73-12856 2I

TRICLADS (PLATHYHELMINTHES)
The Distribution of Stream-Dwelling Triclads (Platyhelminthes) in North Wales,
W73-12971 2I

TRITIUM
Tritium and Deuterium Content of the Snow in Groenland,
W73-12418 5B

Tritium Measurement of Natural Waters on Oahu, Hawaii: A Preliminary Interpretation (Sampling Period: July 1969 to June 1970),
W73-12499 5A

TROPIC LEVEL
Chemistry and Trophic Status of Seven New Zealand Lakes,
W73-12928 5C

TROPICAL REGIONS
Extremes of Hydrometeors at Altitude for Mil-Std-210B: Supplement--Drop-Size Distributions,
W73-12599 2B

TROTTERS (MISS)
Control of Underseepage by Relief Wells, Trotters, Mississippi; Appendix K: 1969 Pumping Tests,
W73-12597 8B

TROUT (METABOLISM)
Metabolic Effects of PCB (Polychlorinated Biphenyls) on the Brown Trout (Salmo trutta),
W73-12819 5C

TUALATIN (ORE)
Tertiary Treatment of Combined Domestic and Industrial Wastes,
W73-12512 5D

TUFA
Observations of Tufa Deposition,
W73-12730 2K

TUNDRA
Simulations of Meteorological Variations Over Arctic Coastal Tundra Under Various Physical Interface Conditions,
W73-12983 2B

TUNICATES
Biomass Characteristics of the Asidian Molgula Manhattensis (Dekay),
W73-12880 5A

TUNNEL CONSTRUCTION
Evaluation of Hydraulic Properties of Rock Masses Influenced by Major Heterogeneities,
W73-12468 8E

TUNNEL DESIGN
Stress Distribution Around a Tunnel Situated in a Layer Under the Action of Gravity,
W73-12490 8E

TUNNEL PRESSURES
Stress Distribution Around a Tunnel Situated in a Layer Under the Action of Gravity,
W73-12490 8E

TUNNELS
Stress Distribution Around a Tunnel Situated in a Layer Under the Action of Gravity,
W73-12490 8E

TUPELO GUM
Nutrient Uptake by Tupelo Gum and Bald Cypress from Saturated or Unsaturated Soil,
W73-12828 2I

TURBIDITY
Mathematical Simulation of the Turbidity Structure within an Impoundment; Hydraulic Laboratory Investigation,
W73-12562 8B

TURBULENT FLOW
Observations of Intermediate and Small Scale Turbulent Water Motion in a Stratified Estuary (Parts I and II),
W73-12424 2L

Numerical Thermal Plume Model for Vertical Outfalls in Shallow Water,
W73-12506 5B

ULTRAFILTRATION
Viruses in Metropolitan Waters: Concentration by Polyelectrolytes, Freeze Concentration, and Ultrafiltration,
W73-12867 5F

ULTRASTRUCTURE
A Study of Inorganic Salts Requirements and Effect on the Morphology of Marine Bacteria,
W73-12628 5C

UNCONFINED SATURATED FLOW
Water Levels Near a Well Discharging From an Unconfined Aquifer,
W73-12777 4B

UNDERGROUND STORAGE
The Disposal of Wastewater Underground,
W73-12781 5E

UNDERSEEPAGE
Control of Underseepage by Relief Wells, Trotters, Mississippi; Appendix K: 1969 Pumping Tests,
W73-12597 8B

UNSTEADY FLOW
Ground Water Models With Parallel Linear Reservoirs,
W73-12723 2F

UNSTEADY RADIAL FLOW
Water Levels Near a Well Discharging From an Unconfined Aquifer,
W73-12777 4B

UPPER CHESAPEAKE BAY
Upper Chesapeake Bay Water Quality Studies, 1968-1971.
W73-12601 5A

URALS
Investigation of Lake-Level Fluctuation Patterns and Moisture Conditions in the Middle and Southern Urals (Issledovaniye zakonomernostey kolebaniy urovnya ozer i uvlazhnennosti Srednego i Yuzhnogo Urala),
W73-12725 2H

URANIUM
Determination of Uranium in Urine Specimens Following Their Separation Through Anion Exchange, (Bestimmung Des Urans in Urinproben Nach Dessen Abtrennung Durch Anionenaustausch),
W73-12931 5A

URBAN AREAS
Stream Quality Preservation Through Planned Urban Development,
W73-12518 5G

URBAN DEVELOPMENT
On The Water Pollution in the Area of Urban Development (In Japanese),
W73-12996 5B

URBAN DEVELOPMENT CORPORATION
Annual Report of the New York State Urban Development Corporation, 1972.
W73-12356 3D

URBAN RENEWAL
Annual Report of the New York State Urban Development Corporation, 1972.
W73-12356 3D

An Evaluation of Baltimore Harbor Land Use Potentials,
W73-12361 6B

URBANIZATION
River Channel Change With Time: An Example,
W73-12590 2J

URINE
Determination of Uranium in Urine Specimens Following Their Separation Through Anion Exchange, (Bestimmung Des Urans in Urinproben Nach Dessen Abtrennung Durch Anionenaustausch),
W73-12931 5A

USSR
Problems in the Production of a Spring Flood (Voprosy formirovaniya vesennego polovod-'ya).
W73-12435 4A

Artificial Recharge of Groundwater and Infiltration Basins (Iskusstvennoye vospolneniye zapasov i infil'tratsionnyye vodozabory podzemnykh vod),
W73-12745 4B

Silica In Thermal and Cold Waters (Kremnezem v termal'nykh i kholodnykh vodakh),
W73-12751 2K

USSR (*ABKHAZIA)
Karst of the Arabika Massif (Karst massiva Arabika),
W73-12742 2K

USSR (AKTYNBINSK OBLAST)
Radiation Regime of Lake Chelkar and Adjoining Regions (O radiatsionnom rezhime ozera Chelkar i prilegayushchey k nemu territorii),
W73-12724 2H

USSR (*CRIMEA)
Hydrophysical Properties and Water Regime of Crimean Southern Chernozems in a Field Crop Rotation (Vodno-fizicheskiye svoystva i vodnyy rezhim yuzhnykh chernozemov Kryma v polevom sevooborote),
W73-12744 2G

USSR (KIRGIZ)
Snow Cover of the Issyk-kul' Depression and Its Alpine Environment (Snezhnyy pokrov Issyk-Kul'skoy kotloviny i yeye vysokogornogo obramleniya),
W73-12726 2C

USSR (KRASNODAR TERRITORY-KUBAN')
Characteristics of Water Migration in a Thick Leached Chernozem (Osobennosti dvizheniya vody v vyshchelochennom moshchnom chernozeme),
W73-12743 2G

UTAH
Sediment-Water Nutrient Interchange in Eutrophic Lakes,
W73-12395 5C

Mathematical Modeling of Water Management Strategies in Urbanizing River Basins,
W73-12509 5G

UTAH LAKE DRAINAGE AREA
Coordination of Agricultural and Urban Water Quality Management in the Utah Lake Drainage Area,
W73-12508 5G

VALDAY FIELD LABORATORY
Laboratory Investigations of the Transmission Capacity of Frozen and Thawed Soils Based on Data of the Valday Field Laboratory (Vnigl) (Laboratornyye issledovaniya vodopropusknoy sposobnosti merzlykh i talykh pochvo-gruntov (po materialam merzlothoy laboratorii VNIGL)),
W73-12437 2G

Estimation and Forecast of Water Losses During a Spring Flood to Groundwater Recharge for Watersheds in Northwestern European USSR Based on Data of the Valday Field Laboratory (Otsenka i prognoz poter' vody v period vesenne go polovod'ya na popolneniye zapasov gruntovykh vod dlya vodosborov Severo-Zapada YeTS (po materialam VNIGL)),
W73-12439 2F

VALLEYS
Climatic Change and Arrested Meander Development on the River Severn,
W73-12737 4A

VALUE
Valuation of Timber, Forage and Water from National Forest Lands,
W73-12701 6B

VARIABILITY
Evaluation of Hydraulic Properties of Rock Masses Influenced by Major Heterogeneities,
W73-12468 8E

VEGETATION
The Influence of Vegetation on the Redox Profile in the Sediment of Grane Langso, A Danish Lobelia Lake,
W73-12379 5C

VEGETATION EFFECTS
Measuring Public Responses to Vegetative Management,
W73-12408 4D

Black Phytokarst From Hell, Cayman Islands, British West Indies,
W73-12593 2J

VEGETATION ESTABLISHMENT
Stone and Woodchip Mulches for Erosion Control on Construction Sites,
W73-12463 4D

Control of Mine Drainage from Coal Mine Mineral Wastes - Phase II - Pollution Abatement and Monitoring,
W73-12516 5G

VERMONT
Considerations for Effective Sloping Land Drainage Systems,
W73-12933 4A

VERTICAL DISPLACEMENTS
Simplified Calculation of Embankment Deformations,
W73-12473 8D

VIBRATION (AEOLIAN)
Energy Method for Computing the Amplitude of Vibration of Conductor Bundles Due to Wake Effect,
W73-12480 8C

VIRGIN ISLANDS
Insecticide Residues in Water and Sediment from Cisterns on the U.S. and British Virgin Islands - 1970,
W73-12894 5B

VIRGINIA
Effects of Proposed Dock Expansion at Newport News on Tides, Currents, and Shoaling; Hydraulic Model Investigation,
W73-12566 8B

Forecasting Storm-Induced Beach Changes Along Virginia's Ocean Coast,
W73-12584 4A

Flood Insurance for Virginia.
W73-12690 6F

VIRUSES
Viruses in Metropolitan Waters: Concentration by Polyelectrolytes, Freeze Concentration, and Ultrafiltration,
W73-12867 5F

Poliovirus in a Water Supply,
W73-12922 5B

Viruses Infecting Peaches in the Murrumbidgee Irrigation Areas of New South Wales,
W73-12981 3F

VIRUSES (FISH)
Handbook of Fish Diseases for Veterinarians and Biologists,
W73-12813 5C

VISCOSITY
Heated Sensors for Flow Measurements,
W73-12618 7B

VOLTAMMETRY
Voltammetric Study of the Hydrogen Ion/Hydrogen Couple in Acetonitrile/Water Mixtures,
W73-12872 2K

WALES
The Distribution of Stream-Dwelling Triclads (Platyhelminthes) in North Wales,
W73-12971 2I

WALES (LLYN TEGID)
The Profundal Fauna of Llyn Tegid, North Wales,
W73-12823 2I

WALLEYE
Conversion, Maintenance and Assimilation for Walleye, Stizostedion Vitreum Vitreum, as Affected by Size, Diet and Temperature
W73-12832 8I

WARSAW (POLAND)
Construction Costs of Water Supply and Sewage Networks in Poland--1961-1970,
W73-12703 6C

WASHINGTON
Methods for Pulp and Paper Mill Sludge Utilization and Disposal,
W73-12519 5E

Grays Harbor Estuary, Washington: Report 2. North Jetty Study,
W73-12581 8B

Dispersion, Dispersal, and Persistence of the Annual Intertidal Alga, Postelsia Palmeformis Ruprecht,
W73-12883 5C

WASTE DILUTION
Methods for the Further Improvement of Spent Liquor Recovery in Lenzing,
W73-12524 5D

WASTE DISPOSAL
Ground Water Pollution in the South Central States,
W73-12515 5B

WASTE DISPOSAL WELLS
Survey of Industrial Waste Injection Wells, Volume II,
W73-12576 5E

Waste Disposal Well Performance,
W73-12779 5E

The Design and Operation of Deep-Well Disposal System,
W73-12780 5E

The Disposal of Wastewater Underground,
W73-12781 5E

WASTE DUMPS
Buffalo Creek Dam Disaster: Why It Happened,
W73-12411 4C

WASTE EMISSION CONTROL
Note on Charges and Bribes in the Long Run within Watersheds,
W73-12702 5G

WASTE HEAT DISPOSAL
Numerical Thermal Plume Model for Vertical Outfalls in Shallow Water,
W73-12506 5B

WASTE IDENTIFICATION
Characterization of Sweet Potato Processing Wastes,
W73-12852 5A

Characterization of Chemical Sludges,
W73-12871 5A

WASTE TREATMENT
Waste Disposal Assembly,
W73-12454 5D

WASTE WATER DISPOSAL
Problems of Groundwater Pollution by Brine,
W73-12770 5B

Waste Disposal Well Performance,
W73-12779 5E

WASTE WATER (POLLUTION)
Determination of Melamine-Formaldehyde Resin in White Waters (Opredelenie soderzhaniya melamino-formaldegidnoi smoly v podsetochnykh vodakh),
W73-12672 5A

Selection of a Suitable System of Effluent Purification (O vybore ratsional'noi sistemy ochistki stochnykh vod),
W73-12673 5D

Application of Liquid Chromatography to Pollution Abatement Studies of Munition Wastes,
W73-12877 5A

Spectrophotometric Determination of Ammonia,
W73-12886 5A

WASTE WATER TREATMENT
Town of Cairo Waste Water Report.
W73-12366 5D

Regional Utilities Study: Sewerage Volume of Technical Appendix.
W73-12369 5D

Waste Water Treatment in Commercial Fish Processing: Reducing Stick Water Loadings,
W73-12420 5D

System for Removing Color From Paper Mill Liquid Waste,
W73-12445 5D

Water Decolorization,
W73-12446 5D

Method of Reducing Phenolic Waste,
W73-12447 5D

Process and Apparatus for Removing Mercury from Waste Water,
W73-12449 5D

Activated Sludge Plant,
W73-12451 5D

Flotation Machine with Vertically Reciprocating Aerators,
W73-12452 5D

Wastewater Treatment System,
W73-12455 5D

Circular Flotation System,
W73-12457 5D

Process of Treating and Purifying Sewage, Particularly of Sewage Contaminated with Detergents,
W73-12458 5D

Waste Water Purification by Breakpoint Chlorination and Carbon Adsorption,
W73-12459 5D

Cross-Flow Filtration Process for Removal of Total Organic Carbon and Phosphates from Aqueous Sewage Effluents,
W73-12460 5D

Waste Treatment System,
W73-12461 5D

Neutralization of Metal Containing Wastes,
W73-12462 5D

Possibilities of Water Treatment by Means of a Magnetic Field,
W73-12481 5D

Wastewater Treatment Design Related to Biological Growth Supported by Activated Carbon,
W73-12494 5D

Phosphorus Removal and Plant Operation Studies at Fort Wayne, Indiana,
W73-12500 5D

Study of Utilization and Disposal of Lime Sludges Containing Phosphates,
W73-12501 5D

Stabilization of Sewage Solids by the Channel Aeration Process,
W73-12502 5D

Disinfection of Sewage Effluents,
W73-12504 5D

Fluidized Bed Clarification as Applied to Wastewater Treatment,
W73-12505 5D

Tertiary Treatment of Combined Domestic and Industrial Wastes,
W73-12512 5D

Identification and Control of Petrochemical Pollutants Inhibitory to Anaerobic Processes,
W73-12513 5D

Demostration of a Waste Disposal System for Livestock Waste,
W73-12517 5D

The Shagawa Lake Project: Lake Restoration by Nutrient Removal from Wastewater Effluent,
W73-12520 5D

Ion Exchange Color and Mineral Removal from Kraft Bleach Wastes,
W73-12522 5D

Methods for the Further Improvement of Spent Liquor Recovery in Lenzing,
W73-12524 5D

Joint Treatment of Pulp Mill Effluents and Municipal Sewage.
W73-12528 5D

Detoxification of Kraft Pulp Mill Effluent by an Aerated Lagoon,
W73-12529 5D

Start-up of Biological Treatment Facilities for Pulp and Paper Mill Wastes,
W73-12531 5D

New Trends in Waste Water Treatment and Recycle,
W73-12533 5D

The TTC Test for the Control of Effluent Purification (Test TTC - Narzedziem kontroli procesu oczyszczania),
W73-12535 5D

Effluent Treatment in Paper and Board Mills.
W73-12537 5D

Waste Treatment Plant at ITT Rayonier Inc. Mill, Fernandina Beach, Florida.
W73-12541 5D

Investigations on Waste Water Clarification with Activated Carbon (Untersuchungen zur Restabwasserklarung mit Aktivkohle),
W73-12543 5D

Practical Decolorization of Kraft Mill Effluents (Praktyka usuwania barwy sciekow posiarczanowych),
W73-12544 5D

Volatile Biochemical Oxygen-Consuming Materials Occurring in the Sulfite Process with Liquor Neutralization and Condensate Recovery: Theoretical Study, (Flyktiga biokemisk syreforbrukande amnens upptradande i sulfitprocessen vid lutneutralisering och kondensataterforing, Teoretisk undersokning),
W73-12546 5D

Microbiological Treatment Parameters of Bleached Kraft Pulp Mill Effluents,
W73-12551 5D

Advanced Pollution Abatement Technology in the Pulp and Paper Industry.
W73-12552 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. A. Physical Operations,
W73-12556 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. B. Biological Systems,
W73-12557 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. C. Chemical Processes, General Observations, and Reports,
W73-12558 5D

Activated Sludge Treatment with Oxygen,
W73-12586 5D

Treatment of Soybean Oil Soapstock to Reduce Pollution,
W73-12668 5D

Selection of a Suitable System of Effluent Purification (O vybore ratsional'noi sistemy ochistki stochnykh vod),
W73-12673 5D

Petroleum...40 Years of Research,
W73-12768 3E

WPCF Project Report: A State Certification Program Guide,
W73-12842 5G

Microbiology in the Aerobic Treatment of Farm Waste,
W73-12890 5D

WASTE WATERS (POLLUTION)
Settleable Matter in Waste Water. Scan-W7:72.
W73-12530 5A

WASTES REUSE
Reuse of Human Wastes in Agriculture,
W73-12817 5D

WASTEWATER TREATMENT
Recondition and Reuse of Organically Contaminated Waste Sodium Chloride Brines,
W73-12521 5D

WATER ALLOCATION (POLICY)
The Effect of Price and Other Selected Variables on Water Consumption,
W73-12495 6B

Water Resource Decison Making--How Effective is the Public Input,
W73-12693 6B

WATER ANALYSIS
The Evaluation of Existing Field Test Kits for Determining Free Chlorine Residuals in Aqueous Solutions,
W73-12426 5A

Settleable Matter in Waste Water. Scan-W7:72.
W73-12530 5A

Determination of Organic Substances in Industrial Effluents (Nektere moznosti stanoveni organickeho znecisteni odpadnich vod),
W73-12532 5A

Upper Chesapeake Bay Water Quality Studies, 1968-1971.
W73-12601 5A

An Interdisciplinary Study of the Estuarine and Coastal Oceanography of Block Island Sound and Adjacent New York Coastal Waters,
W73-12629 5A

Determination of Melamine-Formaldehyde Resin in White Waters (Opredelenie soderzhaniya melamino-formaldegidnoi smoly v podsetochnykh vodakh),
W73-12672 5A

Hydrochemical Description of the Onon-Argun' Steppe (Gidrokhimicheskaya kharakteristika Onon-Argunskoy stepi),
W73-12746 2K

Corrosion Monitoring Method Reduces Effect of Variables in Analyzing Oil Field Waters,
W73-12767 8G

Additional Studies for the Spectrophotometric Measurement of Iodine in Water.
W73-12851 5A

The Monitoring of Organic Matter with Polyurethane Foam,
W73-12868 5A

Application of Liquid Chromatography to Pollution Abatement Studies of Munition Wastes,
W73-12877 5A

Spectrophotometric Determination of Ammonia,
W73-12886 5A

Insecticide Residues in Water and Sediment from Cisterns on the U.S. and British Virgin Islands - 1970,
W73-12894 5B

Membrane Filter Retention--A Source of Error in the C-14 Method of Measuring Primary Production,
W73-12908 5A

WATER CHEMISTRY
Soviet Study Shows Polywater Doesn't Exist.
W73-12540 1B

The Kinetics of Microbiological Modification of Organic Substances in Natural Waters,
W73-12712 5B

Experimental Investigation of Rock Weathering by Salts,
W73-12733 2K

Hydrochemical Description of the Onon-Argun' Steppe (Gidrokhimicheskaya kharakteristika Onon-Argunskoy stepi),
W73-12746 2K

Micellar Solutions Stimulate Wells,
W73-12762 8B

WATER CIRCULATION

Finite Element Shallow Lake Circulation Analysis,
W73-12413 2H

Environmental Isotopes and Circulation in Aquifers Under Venice (Isotopes du Milieu et Circulations dans les Aquiferes du Sous-Sol Venitien),
W73-12419 2F

WATER CONSERVATION

Economics in Soil and Water Conservation,
W73-12691 3F

WATER DISTRIBUTION (APPLIED)

Systems Approach to Metropolitan and Regional Area Water and Sewer Planning,
W73-12351 6A

WATER IMPORTING

Report on Arkansas Valley Conduit for Southeastern Colorado Water Conservancy District, Four Corners Regional Commission and U.S. Bureau of Reclamation.
W73-12577 4A

WATER LEVEL FLUCTUATIONS

Ground Water Models With Parallel Linear Reservoirs,
W73-12723 2F

WATER LEVELS

Sodium-Affected Soils in the Jordan Valley,
W73-12795 2G

WATER LOSS

Principles for Estimating and Forecasting Water Losses in Spring on Watersheds in Northwestern European USSR (Printsipy otsenki i prognoza poter' vesennikh vod na vodosborakh Severo-Zapada YeTS),
W73-12438 2G

Estimation and Forecast of Water Losses During a Spring Flood to Groundwater Recharge for Watersheds in Northwestern European USSR Based on Data of the Valday Field Laboratory (Otsenka i prognoz poter' vody v period vesenne go polovod'ya na popolneniye zapasov gruntovykh vod dlya vodosborov Severo-Zapada YeTS (po materialam VNIGL)),
W73-12439 2F

A Comparison of Rates of Water Loss Through Transpiration of Several Southern New Mexico Phreatophyte Species,
W73-12497 2D

WATER MANAGEMENT (APPLIED)

Hydrologic Models for Poorly Defined Drainage Areas,
W73-12496 2A

Coordination of Agricultural and Urban Water Quality Management in the Utah Lake Drainage Area,
W73-12508 5G

Mathematical Modeling of Water Management Strategies in Urbanizing River Basins,
W73-12509 5G

The Development of a Regional Systems Oriented Water Management Model: A Tool for Policy Analysis,
W73-12839 6A

WATER MEASUREMENT

Generalized Discharge Relations for Cutthroat Flumes,
W73-12474 8B

WATER MITES

Parasitism of Mosquitoes by Water Mites,
W73-12987 2I

WATER POLICY

Multiple-Use Problems in the Great Lakes.
W73-12960 6B

Our Environmental Equilibrium in Nature,
W73-12961 6B

Toward a Regional Policy for the Great Lakes,
W73-12963 6B

The Planning Viewpoint,
W73-12964 6B

An Industrial Point of View-1970,
W73-12965 6B

WATER POLLUTION

Water Pollution in the Pulp and Paper Industry. I. General and In-Plant Modifications,
W73-12553 5D

Water Pollution in the Pulp and Paper Industry. II. Testing Methods,
W73-12554 5A

Water Pollution in the Pulp and Paper Industry. III. Stream Response,
W73-12555 5C

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. A. Physical Operations,
W73-12556 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. B. Biological Systems,
W73-12557 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. C. Chemical Processes, General Observations, and Reports,
W73-12558 5D

An Immobilized Cholinesterase Product for Use in the Rapid Detection of Enzyme Inhibitors in Air or Water,
W73-12901 5A

Behavior of the Goldfish as an Early Warning System for the Presence of Pollutants in Water,
W73-12916 5A

Analytical Reviews 1973/Applications.
W73-12930 5A

On The Water Pollution in the Area of Urban Development (In Japanese),
W73-12996 5B

WATER POLLUTION CONTROL

Waste Water Treatment in Commercial Fish Processing: Reducing Stick Water Loadings,
W73-12420 5D

Mathematical Modeling for Environmental Pollution Control,
W73-12711 5G

Effects of Pesticides in Water--A Report to the States.
W73-12752 5G

Annual Literature Review: Administration, Systems Analysis,
W73-12840 5G

Proposed Oil Pollution Regulations, (Final Environmental Statement).
W73-12955 5G

WATER POLLUTION EFFECTS

Water Pollution in the Pulp and Paper Industry. III. Stream Response,
W73-12555 5C

Heavy Metals in the Environment.
W73-12604 5B

Health Standards for Metals in Drinking Water,
W73-12610 5G

Effect of Heavy Metals on Fish,
W73-12611 5C

Effects of Metals on Fertilization and Development in Fish,
W73-12612 5C

The Role of Heavy Metals in Biology,
W73-12613 5C

Selenium in the Environment,
W73-12614 5C

Biological Effects of Oil Pollution - Selected Bibliography II,
W73-12626 5C

Effects of Pesticides in Water--A Report to the States.
W73-12752 5G

The Use of Fish as Sensors in Industrial Waste Lines to Prevent Fish Kills,
W73-12889 5C

Swimming Performance of Young Atlantic Salmon (Salmo salar) as Affected by Reduced Ambient Oxygen Concentration,
W73-12897 5C

A Symposium on the Preservation and Multiple-Use Problems in the Great Lakes,
W73-12962 5C

Simplification of the Blue Mountain Lichen Communities Near a Zinc Factory,
W73-12973 5C

WATER POLLUTION SOURCES

Control of Oil and Other Hazardous Materials.
W73-12427 5G

Evaluation of ERTS Data for Certain Oceanographic Uses,
W73-12429 7B

Ground Water Pollution in the South Central States,
W73-12515 5B

WATER POLLUTION SOURCES

Use of Coliphages as Indicators of Water pollution,
W73-12525 5A

Optimum Conditions for the Discharge of Paper Industry Effluents (Optimal'noe vodootvedenie stokov bumazhnogo proizvodstva),
W73-12547 5G

Environmental Impact Study.
W73-12580 5G

Heavy Metals in the Environment.
W73-12604 5B

Environmental Contamination by Toxic Metals,
W73-12605 5B

Heavy Metals in Estuaries and the Coastal Zone,
W73-12606 5B

Water Pollution Potential of Manufactured Products--Catalog Section I,
W73-12671-1 5G

Water Pollution Potential of Manufactured Products--Catalog Section II, Product Listing,
W73-12671-2 5G

Water Pollution Potential of Manufactured Products--Catalog Section III, Chemical Ingredient Listing,
W73-12671-3 5G

Mineral Pollution in the Colorado River Basin,
W73-12715 5B

Problems of Groundwater Pollution by Brine,
W73-12770 5B

New Applications of Geophysical Methods to Ground-Water Problems in Pennsylvania,
W73-12783 2F

Salt Pollution of a Shallow Aquifer--Indianapolis, Indiana,
W73-12940 5B

Radiochemical Monitoring of Water After the Cannikin Event, Amchitka Island, Alaska, October, 1972,
W73-12945 5B

Investigation of the Nature, Extent and Fate of Natural Oil Seepage Off Southern California,
W73-12958 5B

A Symposium on the Preservation and Multiple-Use Problems in the Great Lakes,
W73-12962 5C

WATER POLLUTION TREATMENT

Waste Disposal Assembly,
W73-12454 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. A. Physical Operations,
W73-12556 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. B. Biological Systems,
W73-12557 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. C. Chemical Processes, General Observations, and Reports,
W73-12558 5D

WATER PURIFICATION

High-Purity Distilled Water Producing Apparatus,
W73-12450 3A

WATER QUALITY

Critical Review of Currently Available Water Quality Models,
W73-12352 6A

Water Quality Hydrology of Lands Receiving Farm Animal Wastes,
W73-12353 5B

Selected Data on Wells in the Barstow Area, Mojave River Basin, California,
W73-12421 4B

Geohydrology of the Dover Area, Delaware,
W73-12425 7C

Coordination of Agricultural and Urban Water Quality Management in the Utah Lake Drainage Area,
W73-12508 5G

Mathematical Modeling of Water Management Strategies in Urbanizing River Basins,
W73-12509 5G

Upper Chesapeake Bay Water Quality Studies, 1968-1971.
W73-12601 5A

Water Quality Determinations in the Virgin Islands from ERTS-A Data,
W73-12630 5A

Determination of Public Environmental Preferences in Water Resources Planning and Development,
W73-12706 6B

Hydrogeology of the Carbonate Rocks, Frederick and Hagerstown Valleys, Maryland,
W73-12719 4B

Water Quality in the Middle Fork Feather River, California, May 1970 Through September 1971,
W73-12720 5A

Hydrochemical Description of the Onon-Argun' Steppe (Gidrokhimicheskaya kharakteristika Onon-Argunskoy stepi),
W73-12746 2K

Some Effects of Evaporation Suppression on Reservoir Ecology,
W73-12869 5C

Chemistry and Trophic Status of Seven New Zealand Lakes,
W73-12928 5C

Trace Metal Baseline Studies on the Murderkill and St Jones Rivers, Delaware Coastal Plain,
W73-12959 5B

WATER QUALITY CONTROL

Identification of Water Resources Planning Problems in the Metropolitan Area of Greater San Antonio and Its Associated Counties,
W73-12354 6B

The Role of Zooplankton in the Process of Eutrophication,
W73-12397 5C

Mathematical modeling of Phytoplankton Populations,
W73-12399 5C

Waste Disposal Assembly,
W73-12454 5D

WATER QUALITY STANDARDS

The Niagara River Pollution Abatement Progress - 1971.
W73-12380 5G

Health Standards for Metals in Drinking Water,
W73-12610 5G

Identification and Achievement of Environmental Quality Levels in Managing the Use of Natural Resources,
W73-12696 5G

WATER REQUIREMENTS

Water Metabolism in Desert Sheep, Effects of Various Degrees of Water Restriction on the Distribution of Body Water in Mariwari Sheep,
W73-12788 3F

WATER RESOURCES

New Techniques for Participative Planning in Water Resources,
W73-12472 6B

Reports for California by the Geological Survey Water Resources Division.
W73-12953 2A

Publications of Water Resources Investigations in Colorado and Selected Publications Pertaining to Colorado.
W73-12954 2A

WATER RESOURCES DEVELOPMENT

Identification of Water Resources Planning Problems in the Metropolitan Area of Greater San Antonio and Its Associated Counties,
W73-12354 6B

Water Resource Decison Making--How Effective is the Public Input,
W73-12693 6B

Evaluation of the Water Resources of Lemmon Valley, Washoe County, Nevada, With Emphasis on Effects of Ground-Water Development to 1971,
W73-12718 4B

Elements of the Water Resources Situation in Alabama,
W73-12749 6B

Multiple-Use Problems in the Great Lakes.
W73-12960 6B

Our Environmental Equilibrium in Nature,
W73-12961 6B

An Industrial Point of View-1970,
W73-12965 6B

WATER REUSE

A Pilot Fish-Pond System for Utilization of Sewage Effluents, Humboldt Bay, Northern California,
W73-12434 5D

Evaluation of Urban Water Management Policies in the Denver Metropolitan Area,
W73-12510 5G

New Trends in Waste Water Treatment and Recycle,
W73-12533 5D

Volatile Biochemical Oxygen-Consuming Materials Occurring in the Sulfite Process with Liquor Neutralization and Condensate Recovery: Theoretical Study, (Flyktiga

biokemisk syreforbrukande amnens upptradande i sulfitprocessen vid lutneutralisering och kondensataterforing, Teoretisk undersokning),
W73-12546 5D

Significance of Heating Agricultural Soils,
W73-12802 3F

WATER SAMPLING
A Topologically Optimum River Sampling Plan for South Carolina,
W73-12498 5B

WATER STORAGE
Principles for Estimating and Forecasting Water Losses in Spring on Watersheds in Northwestern European USSR (Printsipy otsenki i prognoza poter' vesennikh vod na vodosborakh Severo-Zapada YeTS),
W73-12438 2G

Results of a Study of Water Regime of Soils on Small Watersheds in the Don River Basin (Rezul'taty izucheniya vodnogo rezhima pochv malykh vodosborov v basseyne r. Dona),
W73-12441 2G

Methods of Determining Soil Moisture Storage in Winter (K metodike opredeleniya vlagozapasov pochvy v zimniy period goda),
W73-12444 2G

WATER SUPPLY
Comprehensive Public Water Supply Study for Schenectady County, New York.
W73-12358 3D

Interim Areawide Water and Sewer Plan: Bel-O-Mar area.
W73-12362 5G

Kay County, Oklahoma, Water and Sewerage Comprehensive Plan.
W73-12364 5G

Functional Water and Sewerage Plan and Program, Pee Dee Region, South Carolina.
W73-12365 5G

Mathematical Modeling of Water Management Strategies in Urbanizing River Basins,
W73-12509 5G

Ground-Water Resources, Nelson and Walsh Counties, North Dakota,
W73-12578 2F

Construction Costs of Water Supply and Sewage Networks in Poland--1961-1970,
W73-12703 6C

Hydrogeology of the Carbonate Rocks, Frederick and Hagerstown Valleys, Maryland,
W73-12719 4B

Poliovirus in a Water Supply,
W73-12922 5B

WATER SUPPLY DEVELOPMENT
Public Support of Private Water Resource Development in Agriculture--With Implications for Firm Growth,
W73-12698 4B

WATER SURFACE PROFILES
Computer Determination of Critical Depth Control Points in Open Channel Flow,
W73-12483 8B

WATER TABLE
Sodium-Affected Soils in the Jordan Valley,
W73-12795 2G

Growth and Chemical Composition of Eight Grasses Grown Under High Water Table Conditions,
W73-12972 2I

WATER TEMPERATURE
Heated Sensors for Flow Measurements,
W73-12618 7B

Water Temperature and the Migrations of American Shad,
W73-12666 2I

WATER TEMPERATURES
A Hydrographic Atlas of Larger North Carolina Sounds,
W73-12948 2L

WATER TRANSFER
Report on Arkansas Valley Conduit for Southeastern Colorado Water Conservancy District, Four Corners Regional Commission and U.S. Bureau of Reclamation.
W73-12577 4A

WATER TRANSPORTATION
Survey of Water Transportation Potential to Reduce Congestion and Pollution in Washington, D.C. and Other Major Cities.
W73-12363 5G

WATER TREATMENT
High-Purity Distilled Water Producing Apparatus,
W73-12450 3A

Possibilities of Water Treatment by Means of a Magnetic Field,
W73-12481 5D

WATER TYPES
Silica In Thermal and Cold Waters (Kremnezem v termal'nykh i kholodnykh vodakh),
W73-12751 2K

WATER UTILIZATION
The Effect of Price and Other Selected Variables on Water Consumption,
W73-12495 6B

WATER VAPOR
Water Vapor Adsorption by Water-Repellent Soils at Equilibrium,
W73-12968 2G

WATER WELL CONSTRUCTION
Guide Specification for Chemical Grouts.
W73-12782 8G

WATER WELLS
Selected Data on Wells in the Barstow Area, Mojave River Basin, California,
W73-12421 4B

Ground-Water Resources, Nelson and Walsh Counties, North Dakota,
W73-12578 2F

Evaluation of the Water Resources of Lemmon Valley, Washoe County, Nevada, With Emphasis on Effects of Ground-Water Development to 1971,
W73-12718 4B

Hydrogeology of the Carbonate Rocks, Frederick and Hagerstown Valleys, Maryland,
W73-12719 4B

Pitless Units and Adapters,
W73-12776 8G

WATER YIELD
Flow to Wells Near Streams in the Presence of Delayed Yield From Storage and Analysis of Pumping Test Data,
W73-12943 4B

WATERFLEAS
Crustacean Plankton and the Eutrophication of Lakes in the Okanagan Valley, British Columbia,
W73-12624 5C

WATERFOWL
Waterfowl Utilization of Beaver Ponds in New Brunswick,
W73-12662 2I

WATERSHED MANAGEMENT
Sixteenth Annual Arizona Watershed Symposium Proceedings.
W73-12403 4D

Wildlife Habitat Improvement in Relation to Watershed Management in the Southwest,
W73-12404 4D

Responses od Deer and Elk to Beaver Creek Watershed Treatments,
W73-12405 4D

A Treatment Prescription for Improving Big Game Habitat in Ponderosa Pine Forests,
W73-12406 4D

The Visual Aspects of Resource Management,
W73-12407 4D

WATERSHEDS
Outdoor Recreation in the Baltimore Area.
W73-12360 6D

Regional Utilities Study: Drainage Volume of Technical Appendix.
W73-12368 4A

WATERSHEDS (BASINS)
Principles for Estimating and Forecasting Water Losses in Spring on Watersheds in Northwestern European USSR (Printsipy otsenki i prognoza poter' vesennikh vod na vodosborakh Severo-Zapada YeTS),
W73-12438 2G

Estimation and Forecast of Water Losses During a Spring Flood to Groundwater Recharge for Watersheds in Northwestern European USSR Based on Data of the Valday Field Laboratory (Otsenka i prognoz poter' vody v period vesenne go polovod'ya na popolneniye zapasov gruntovykh vod dlya vodosborov Severo-Zapada YeTS (po materialam VNIGL)),
W73-12439 2F

A Suggested New Approach to the Analysis of Drainage Basin Shapes,
W73-12729 4A

WAVE ABSORBERS
Reflection Characteristics of Screen Wave Absorbers; Hydraulic Model Investigation,
W73-12561 8B

WAVE ATTENUATION
Wave Damping Effects of Fibrous Screens; Hydraulic Model Investigation,
W73-12564 8B

WAVE REFLECTION
Reflection Characteristics of Screen Wave Absorbers; Hydraulic Model Investigation,
W73-12561 8B

WAVES (WATER)
Long Wave Propagation in Idealized Estuary,
W73-12417 2L

Wave Transmission Through Rock Structures; Hydraulic Model Investigation,
W73-12563 8B

Computer Models of Delta Growth Due to Sediment Input From Rivers and Longshore Transport,
W73-12592 2J

WEATHER FORECASTING
Climatology of Rainfall Probabilities for Oahu, Hawaii,
W73-12587 2B

WEATHERING
Black Phytokarst From Hell, Cayman Islands, British West Indies,
W73-12593 2J

Experimental Investigation of Rock Weathering by Salts,
W73-12733 2K

WEED CONTROL
Herbicide Contamination of Surface Runoff Waters,
W73-12511 5B

WELDED JOINTS
Welding of a Normalized High Strength Low Alloy Plate Steel of Structural Quality,
W73-12466 8G

WELDING
Welding of a Normalized High Strength Low Alloy Plate Steel of Structural Quality,
W73-12466 8G

WELFARE (ECONOMICS)
Environmental Policy Issues: Real and Fictitious,
W73-12676 6B

The Set up of the Statistical System Within Which the Deterioration of the Human Environment will be Estimated,
W73-12681 6B

Externalities, Welfare, And the Feasibility of Corrective Taxes,
W73-12694 6B

WELL CONSTRUCTION
Here's a New Sand Pack Method,
W73-12761 8G

WELL DATA
Selected Data on Wells in the Barstow Area, Mojave River Basin, California,
W73-12421 4B

WELL DESIGN
The Design and Operation of Deep-Well Disposal System,
W73-12780 5E

WELL DEVELOPMENT
Back-Surge Technique Improves Well Completions,
W73-12773 8B

WELL DRILLING
Diamond-Bit Research Provides Basic Drilling Parameters,
W73-12764 8B

Well Logs can Indicate Formation Drillability,
W73-12769 8E

WELL SCREENS
Rational Design of Well Screens,
W73-12771 8B

WELL STIMULATION
Micellar Solutions Stimulate Wells,
W73-12762 8B

WELLS
Control of Underseepage by Relief Wells, Trotters, Mississippi; Appendix K: 1969 Pumping Tests,
W73-12597 8B

Well Logs can Indicate Formation Drillability,
W73-12769 8E

Back-Surge Technique Improves Well Completions,
W73-12773 8B

Pitless Units and Adapters,
W73-12776 8G

Water Levels Near a Well Discharging From an Unconfined Aquifer,
W73-12777 4B

WELWITSCHIA
Welwitschia Mirabilis: Paradox of the Namib Desert,
W73-12796 2I

WEST POINT LAKE (GA.)
Preimpoundment Study of West Point Lake, Georgia,
W73-12376 5C

WEST VIRGINIA
Interim Areawide Water and Sewer Plan: Bel-O-Mar area.
W73-12362 5G

Buffalo Creek Dam Disaster: Why It Happened,
W73-12411 4C

WETLANDS
Effects of Stream Channeling on Wetlands in a Minnesota Watershed,
W73-12667 4A

WHEAT
Water Pathways in Higher Plants: II. Water Pathways in Roots,
W73-12651 2I

WHEAT (DWARF)
Consumptive Use of Water by Dwarf Wheat in Udaipur Valley,
W73-12387 3F

WHEAT GERMINATION
Germination of Wheat as Affected by Soil Water Stress,
W73-12884 3F

WHEAT GROWTH
Influence of Different Moisture Regimes and Methods of Phosphate Application on Growth and Nutrient Absorption by Wheat (Triticum Aestivum L.),
W73-12539 3F

WHEAT-M
Effect of Quality of Well Waters on the Germination and Mineral Composition of Wheat on Saline-Sodic Soils Rich in Magnesium,
W73-12809 3C

WHITE CROAKERS
DDT Residues in White Croakers,
W73-12835 5C

WHITE WATER
Effluent Treatment in Paper and Board Mills.
W73-12537 5D

WHITEFISH
Steam Distillation: A Simple Technique for Recovery of Petroleum Hydrocarbons from Tainted Fish,
W73-12849 5A

WILD RIVERS
Water Quality in the Middle Fork Feather River, California, May 1970 Through September 1971,
W73-12720 5A

WILDLIFE
Mercury Levels in Wisconsin Fish and Wildlife,
W73-12812 5A

WILDLIFE HABITATS
Sixteenth Annual Arizona Watershed Symposium Proceedings.
W73-12403 4D

Wildlife Habitat Improvement in Relation to Watershed Management in the Southwest,
W73-12404 4D

Responses od Deer and Elk to Beaver Creek Watershed Treatments,
W73-12405 4D

A Treatment Prescription for Improving Big Game Habitat in Ponderosa Pine Forests,
W73-12406 4D

WILDLIFE MANAGEMENT
Wildlife Habitat Improvement in Relation to Watershed Management in the Southwest,
W73-12404 4D

Responses od Deer and Elk to Beaver Creek Watershed Treatments,
W73-12405 4D

WIND (METEOROLOGY)
Energy Method for Computing the Amplitude of Vibration of Conductor Bundles Due to Wake Effect,
W73-12480 8C

WINTER
Methods of Determining Soil Moisture Storage in Winter (K metodike opredeleniya vlagozapasov pochvy v zimniy period goda),
W73-12444 2G

WISCONSIN
The Sediments and History of Lake Butte des Morts, Wisconsin,
W73-12355 2J

Joint Treatment of Pulp Mill Effluents and Municipal Sewage.
W73-12528 5D

Nitrification in Sediments of Selected Wisconsin Lakes,
W73-12763 5C

Mercury Levels in Wisconsin Fish and Wildlife,
W73-12812 5A

Nitrogen Release from Lake Sediments,
W73-12860 5B

Investigation of the Environmental Factors Which Affect the Anaerobic Decomposition of Fibrous Sludge Beds on Stream Bottoms,
W73-12936 5B

WOOD WASTES
Methods for Pulp and Paper Mill Sludge Utilization and Disposal,
W73-12519 5E

WYOMING
Public Support of Private Water Resource Development in Agriculture--With Implications for Firm Growth,
W73-12698 4B

X-RAY FLUORESCENCE
Sensitivity and Detectability Limits for Elemental Analysis by Proton-Induced X-Ray Fluorescence with a 3 Mv Van de Graaff,
W73-12935 5A

YELLOW MEDICINE RIVER (MINN)
Fishes of the Yellow Medicine River in Southwestern Minnesota,
W73-12821 2I

ZAMBIAN FLOODPLAIN
The Annual Cycle of Small Mammal Populations on a Zambian Floodplain,
W73-12814 2I

ZECTRAN
Effects of Zectran Insecticide on Aquatic Organisms in Bear Valley Creek, Idaho,
W73-12634 5C

ZINC
Mortality Curves of Bluegills (Lepomis Macrochirus Rafinesque) Simultaneously Exposed to Temperature and Zinc Stress,
W73-12637 5C

ZINC FACTORY
Simplification of the Blue Mountain Lichen Communities Near a Zinc Factory,
W73-12973 5C

ZOOPLANKTON
The Role of Zooplankton in the Process of Eutrophication,
W73-12397 5C

The Zooplankton of the Gulf of Guinea,
W73-12623 5A

Crustacean Plankton and the Eutrophication of Lakes in the Okanagan Valley, British Columbia,
W73-12624 5C

Annual Life Cycle and Production of the Chaetognath Sagitta elegans in Bedford Basin, Nova Scotia,
W73-12898 5B

The Characterization of Soluble Phosphorus Released by Limnetic Zooplankton,
W73-12904 5B

Estimation of Mortality Coefficients from Field Samples of Zooplankton,
W73-12906 5C

Quantitative Sampling of Live Zooplankton With a Filter-Pump System,
W73-12911 5A

AUTHOR INDEX

AARONSON, S.
Effect of Incubation Temperature on the Macromolecular and Lipid Content of the Phytoflagellate Ochromonas danica,
W73-12896 5C

ABIODUN, A. A.
Analysis of Seepage Into Ground-Water System,
W73-12412 4B

ABROL, I. P.
Leaching Salty Soils,
W73-12789 2G

ACKMAN, R. G.
Steam Distillation: A Simple Technique for Recovery of Petroleum Hydrocarbons from Tainted Fish,
W73-12849 5A

ADELMAN, A. H.
Photosulfoxidation of Hydrocarbons in the Liquid Phase,
W73-12833 2K

ADRIANO, D. C.
Soil Nitrogen Balance in Selected Row-Crop Sites in Southern California,
W73-12670 3F

AHR, W. M.
Long-Lived Pollutants in Sediments From the Laguna Atascosa National Wildlife Refuge, Texas,
W73-12595 5B

ALBERT, K. S.
Aromatic Hydroxylation as an Analytical Reaction,
W73-12853 5A

ALEKSANDROVA, L. S.
Radiation Regime of Lake Chelkar and Adjoining Regions (O radiatsionnom rezhime ozera Chelkar i prilegayushchey k nemu territorii),
W73-12724 2H

ALEKSEYENKO, V. A.
Hydrochemical Description of the Onon-Argun' Steppe (Gidrokhimicheskaya kharakteristika Onon-Argunskoy stepi),
W73-12746 2K

ALEXANDER, A. L.
Corrosion of Metals in Tropical Waters—Structural Ferrous Metals,
W73-12772 8G

ALEXANDER, S. S.
New Applications of Geophysical Methods to Ground-Water Problems in Pennsylvania,
W73-12783 2F

ALEXEEV, E. S.
Flotation Machine with Vertically Reciprocating Aerators,
W73-12452 5D

ALGUIRE, R. T.
Systems Approach to Metropolitan and Regional Area Water and Sewer Planning,
W73-12351 6A

ALLAM, A. I.
Aqueous Iron-Sulfur Systems in Rice Field Soils of Louisiana,
W73-12385 3F

ALLEN, A. A.
Investigation of the Nature, Extent and Fate of Natural Oil Seepage Off Southern California,
W73-12958 5B

ALLEN, G.
A Pilot Fish-Pond System for Utilization of Sewage Effluents, Humboldt Bay, Northern California,
W73-12434 5D

ALLISON, R. C.
Some Effects of Evaporation Suppression on Reservoir Ecology,
W73-12869 5C

ALPEROVITCH, N.
Sodium-Affected Soils in the Jordan Valley,
W73-12795 2G

ALVIS, R. L.
Comparison of Waterflood Corrosion Detection and Monitoring Devices,
W73-12757 8G

AMBE, Y.
Determination of Alkylbenzenesulfonate (ABS) in Bottom Sediment,
W73-12932 5A

AMBERG, H. R.
Methods for Pulp and Paper Mill Sludge Utilization and Disposal,
W73-12519 5E

AMERNATH, D. M.
Consumptive Use of Water by Cotton Grown in Transition Tract of Dharwar Under Rainfed Conditions,
W73-12988 3F

AMLACHER, E.
Handbook of Fish Diseases for Veterinarians and Biologists,
W73-12813 5C

ANDERSEN, J. M.
The Influence of Vegetation on the Redox Profile in the Sediment of Grane Langso, A Danish Lobelia Lake,
W73-12379 5C

ANDERSON, D. V.
Our Environmental Equilibrium in Nature,
W73-12961 6B

ANDERSON, E. W.
Terracettes: A Suggested Classification,
W73-12731 2J

ANDERSON, N. H.
Microdistribution and Density as Factors Affecting the Downstream Drift of Mayflies,
W73-12888 2I

ANDERSON, W. P.
Characterization of Exudation from Excised Roots of Onion, Allium Cepa: I. Water Flux,
W73-12989 3F

ANDREYEVA, M. A.
Investigation of Lake-Level Fluctuation Patterns and Moisture Conditions in the Middle and Southern Urals (Issledovaniye zakonomernostey kolebaniy urovnya ozer i uvlazhnennosti Srednego i Yuzhnogo Urala),
W73-12725 2H

ARMSTRONG, D. E.
Phosphate Chemistry in Lake Sediments,
W73-12917 5C

ARNALDS, S.
Ground Water Models With Parallel Linear Reservoirs,
W73-12723 2F

ARON, G.
Simplified Solution for Decreasing Flow in Wells,
W73-12759 8B

ARSENAULT, L. J.
Optimum Procedure for the Determination of Selenium in Biological Specimens Using Se-77m Neutron Activation,
W73-12876 5A

ASHLEY, G. M.
Glacial Environment and Processes in Southeastern Alaska,
W73-12423 2C

ASPITARTE, T. R.
Methods for Pulp and Paper Mill Sludge Utilization and Disposal,
W73-12519 5E

ATTON, F. M.
Uptake of Mercury by Caged Rainbow Trout (Salmo Gairdneri) in the South Saskatchewan River,
W73-12857 5C

ATWATER, M. A.
Simulations of Meteorological Variations Over Arctic Coastal Tundra Under Various Physical Interface Conditions,
W73-12983 2B

AUSTIN, E. R.
Nitrogen Release from Lake Sediments,
W73-12860 5B

AXELSSON, O.
Volatile Biochemical Oxygen-Consuming Materials Occurring in the Sulfite Process with Liquor Neutralization and Condensate Recovery: Theoretical Study, (Flyktiga biokemisk syreforbrukande amnens upptradande i sulfitprocessen vid lutneutralisering och kondensataterforing, Teoretisk undersokning),
W73-12546 5D

BAILEY, E. W.
Cathodic Protection for Coated Steel Pipelines,
W73-12765 8G

BAILEY, M. M.
Age, Growth Reproduction, and Food of the Burbot, Lota lota (Linnaeus), in Southwestern Lake Superior,
W73-12934 2H

BAIN, RICHARD C. JR
Nutrient Control in North San Francisco Bay,
W73-12398 5C

BAINBRIDGE, V.
The Zooplankton of the Gulf of Guinea,
W73-12623 5A

BALDWIN, J.
Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol III - Physical,
W73-12755 2H

BALLANCE, W. C.
Radiochemical Monitoring of Water After the Cannikin Event, Amchitka Island, Alaska, October, 1972,
W73-12945 5B

BALLARD, L. N.
Neutralization of Metal Containing Wastes,
W73-12462 5D

BALUTA, H.
Boost A/D Rates with Staggered Operation,
W73-12893 7C

BANWART, W. L.
Determination of Ammonium in Soil Extracts and Water Samples by an Ammonia Electrode,
W73-12939 2G

BARBA, D.
Heat-Exchanger for Desalting Sea Water,
W73-12453 3A

BARDACH, J. E.
Aqualculutre: The Farming and Husbandry of Freshwater and Marine Organisms,
W73-12830 3F

BARKLEY, R. A.
Selectivity of Towed-Net Samplers,
W73-12669 7B

BARKSDALE, H. C.
Elements of the Water Resources Situation in Alabama,
W73-12749 6B

BARNES, B. B.
An Approach to Hydrogeologic Investigations of River Alluvium by the Use of Computerized Data Processing Techniques,
W73-12942 2A

BARNETT, ANDY H.
Determination of Public Environmental Preferences in Water Resources Planning and Development,
W73-12706 6B

BARRETT, J. W. H.
Computing Backwater at Open Channel Constrictions,
W73-12415 8B

BARTLETT, R. J.
Rapid Field Determination of Nitrate in Natural Waters,
W73-12810 2K

BAYNE, B. L.
Physiological Changes in Mytilus Edulis L. Induced by Temperature and Nutritive Stress,
W73-12878 5C

BEAL, R. E.
Treatment of Soybean Oil Soapstock to Reduce Pollution,
W73-12668 5D

BEAMISH, R. J.
Design of Trapnet with Interchangeable Parts for the Capture of Large and Small Fishes from Varying Depths,
W73-12899 8I

BEARSE, R. C.
Sensitivity and Detectability Limits for Elemental Analysis by Proton-Induced X-Ray Fluorescence with a 3 Mv Van de Graaff,
W73-12935 5A

BECKERMAN, W.
Environmental Policy Issues: Real and Fictitious,
W73-12676 6B

BELLA, D. A.
A Mathematical Model of the Nutrient Dynamics of Phytoplankton in a Nitrate-Limited Environment,
W73-12915 5C

BELLIVEAU, P. E.
pH-Sensitive Fluorogenic Spray Reagents: II. Quantitative Studies with Pesticides,
W73-12727 5A

BENNETT, D. H.
Length-Weight Relationship and Condition Factors of Fishes From a South Carolina Reservoir Receiving Thermal Effluent,
W73-12774 5C

BENNETT, R. S.
Generalized Discharge Relations for Cutthroat Flumes,
W73-12474 8B

BENOIT, G. R.
Considerations for Effective Sloping Land Drainage Systems,
W73-12933 4A

BENS, E. M.
Selective Substrate Utilization by Marine Hydrocarbonoclastic Bacteria,
W73-12621 5B

BENTER, W. P. JR
Welding of a Normalized High Strength Low Alloy Plate Steel of Structural Quality,
W73-12466 8G

BEOUGHER, L. C.
A Method for High Speed BCD-to-Binary Conversion,
W73-12892 7C

BERGSTRAND, E.
Exploratory Bottom Trawling in Lake Victoria,
W73-12803 2H

BERKOWITZ, J. B.
Water Pollution Potential of Manufactured Products--Catalog Section I,
W73-12671-1 5G

Water Pollution Potential of Manufactured Products--Catalog Section II, Product Listing,
W73-12671-2 5G

Water Pollution Potential of Manufactured Products--Catalog Section III, Chemical Ingredient Listing,
W73-12671-3 5G

BERTINE, K.
Lead Pollution: Records in Southern California Coastal Sediments,
W73-12589 5B

BHADRAPUR, T. G.
The Quality of Drainage Water from Irrigated Black Cotton Soils for Irrigation,
W73-12650 3F

BHUMBLA, D. R.
Leaching Salty Soils,
W73-12789 2G

BIGGS, R. B.
Trace Metal Baseline Studies on the Murderkill and St Jones Rivers, Delaware Coastal Plain,
W73-12959 5B

BIRKBECK, A. E.
Microbiological Treatment Parameters of Bleached Kraft Pulp Mill Effluents,
W73-12551 5D

BISCOE, C. JR
Classification of the Coastal Environments of the World: Part II. Africa,
W73-12950 2L

BISHOP, D. F.
Activated Sludge Treatment with Oxygen,
W73-12586 5D

Waste Water Purification by Breakpoint Chlorination and Carbon Adsorption,
W73-12459 5D

BISWAS, A. K.
Evaluation of Environmental Intangibles,
W73-12688 6B

BISWAS, N. R. D.
Erodibility of Hill Soils of Sutlej Catchment Area in Himachal Pradesh,
W73-12635 2J

BLACK, T. A.
Average Bowen-Ratio Methods of Calculating Evaportranspiration Applied to a Douglas Fir Forest,
W73-12801 2D

BLACKMAN, W. C. JR
Mineral Pollution in the Colorado River Basin,
W73-12715 5B

BLIGH, E. G.
Mercury in Canadian Fish,
W73-12970 5C

BLOTCKY, A. J.
Optimum Procedure for the Determination of Selenium in Biological Specimens Using Se-77m Neutron Activation,
W73-12876 5A

BLUEMLE, J. P.
Geology of Nelson and Walsh Counties, North Dakota,
W73-12579 2F

BOBB, W. H.
Sea-Land Navigation Studies; Hydraulic Model Investigation,
W73-12567 8B

BOGOMOLOV, G. V.
Silica In Thermal and Cold Waters (Kremnezem v termal'nykh i kholodnykh vodakh),
W73-12751 2K

BOHAN, J. P.
Mathematical Simulation of the Turbidity Structure within an Impoundment; Hydraulic Laboratory Investigation,
W73-12562 8B

Selective Withdrawal from Man-Made Lakes, Hydraulic Laboratory Ivestigation,
W73-12569 4A

BOLAND, R. A. JR
Effects of Proposed Dock Expansion at Newport News on Tides, Currents, and Shoaling; Hydraulic Model Investigation,
W73-12566 8B

BOOKER, J. R.
Simplified Calculation of Embankment Deformations,
W73-12473 8D

BOPP, F. III
Trace Metal Baseline Studies on the Murderkill and St Jones Rivers, Delaware Coastal Plain,
W73-12959 5B

BORDEN, A. G.
Waste Disposal Assembly,
W73-12454 5D

BORNMAN, C. H.
Welwitschia Mirabilis: Paradox of the Namib Desert,
W73-12796 2I

BORNSTEIN, J.
Considerations for Effective Sloping Land Drainage Systems,
W73-12933 4A

BORTOLAMI, G.
Environmental Isotopes and Circulation in Aquifers Under Venice (Isotopes du Milieu et Circulations dans les Aquiferes du Sous-Sol Venitien),
W73-12419 2F

BOSTER, R. S.
Measuring Public Responses to Vegetative Management,
W73-12408 4D

BOSTRACK, J. M.
Stabilization of Sewage Solids by the Channel Aeration Process,
W73-12502 5D

BOURGEOIS, W. W.
Application of Acrylic Plastic Tension Lysimeters to Sloping Land,
W73-12638 2G

BOVEY, R. W.
Auger Soil Sampler for Herbicide Residues,
W73-12794 2G

BOWDEN, L. W.
Process-Form Variability of Multiclass Coasts: Baja California,
W73-12422 2L

BOWEN, J. E.
Effect of Environmental Factors on Water Utilization and Boron Accumulation and Translocation in Sugarcane,
W73-12966 3F

BOYCE, S.
Nutrients in Nebraska's Waters,
W73-12615 5B

BOYD, C. E.
Sources of CO2 for Nuisance Blooms of Algae,
W73-13000 5C

BOYD, M. B.
Disposal of Dredge Spoil; Problem Identification and Assessment and Research Program Development,
W73-12573 4A

BRANTON, C. I.
Annual Water Balance and Agricultural Development in Alaska,
W73-12664 3F

BRAUHN, J. L.
Use of Cold Brands on Channel Catfish,
W73-12778 8I

BRAY, A. N. G.
Large Hydraulic Gates and Valves in the Snowy Mountain Scheme--A Review of Practice,
W73-12476 8C

BREMMER, J. M.
Determination of Ammonium in Soil Extracts and Water Samples by an Ammonia Electrode,
W73-12939 2G

BRETT, J. R.
The Effects of Sublethal Concentrations of Whole Bleached Kraftmill Effluent on the Growth and Food Conversion Efficiency of Underyearling Sockeye Salmon (Oncorhynchus nerka),
W73-12913 5C

BRICE, R. M.
The Shagawa Lake Project: Lake Restoration by Nutrient Removal from Wastewater Effluent,
W73-12520 5D

BRINCK, C. W.
WPCF Project Report: A State Certification Program Guide,
W73-12842 5G

BROCKWAY, D. L.
Carbon Cycle in Sediment-Water Systems,
W73-12846 5C

BROGDON, N. J. JR
Grays Harbor Estuary, Washington: Report 2. North Jetty Study,
W73-12581 8B

BROWN, C. M.
The Mechanisms of Nitrogen Assimilation in Pseudomonads,
W73-12881 5C

BROWN, R. D.
Disposal of Dredge Spoil; Problem Identification and Assessment and Research Program Development,
W73-12573 4A

BROWN, RANDALL L.
AGP Studies in the San Francisco Bay-Delta,
W73-12401 5C

Effects of Light and Temperature on Algal Growth,
W73-12396 5C

Phosphorus and Eutrophication,
W73-12394 5C

BROWNING, J. M.
Catastrophic Rock Slide, Mount Huascaran, North-Central Peru, May 31, 1970,
W73-12409 2J

BROYER, T. C.
Effects of Aeration, Water Supply, and Nitrogen Source on Growth and Development of Tupelo Gum and Bald Cypress,
W73-12923 2I

Nutrient Uptake by Tupelo Gum and Bald Cypress from Saturated or Unsaturated Soil,
W73-12828 2I

Poliovirus in a Water Supply,
W73-12922 5B

BRUEHL, G. W.
Influence of Water Potential on Growth, Antibiotic Production and Survival of Cephalosporium gramineum,
W73-12999 5B

BRUGER, G. E.
Investigations on American Shad in the St. Johns River,
W73-12370 2H

BRULAND, K. W.
Lead Pollution: Records in Southern California Coastal Sediments,
W73-12589 5B

BRUNNER, P. L.
Phosphorus Removal and Plant Operation Studies at Fort Wayne, Indiana,
W73-12500 5D

BRYDOY, S.
Vessel for the Removal of Oil on Water,
W73-12448 5G

BUELOW, R. W.
An Improved Method For Determining Organics by Activated Carbon Adsorption and Solvent Extraction - Pt. II (Test Method),
W73-12866 5A

BUHLER, D. R.
Environmental Contamination by Toxic Metals,
W73-12605 5B

BULLOCK, P. A.
Forecasting Storm-Induced Beach Changes Along Virginia's Ocean Coast,
W73-12584 4A

BURKE, G. W. JR
WPCF Project Report: A State Certification Program Guide,
W73-12842 5G

BURNS, W. F.
Circular Flotation System,
W73-12457 5D

BURNSTEIN, S.
An Industrial Point of View-1970,
W73-12965 6B

BURROUGHS, E. R. JR
Effects of Air Gaps and Saturated Voids on Accuracy of Neutron Moisture Measurements,
W73-12636 2G

BURROWS, W. D.
Total Mercury Analysis: Review and Critique,
W73-12885 5A

BURTON, D. T.
Mortality Curves of Bluegills (Lepomis Macrochirus Rafinesque) Simultaneously Exposed to Temperature and Zinc Stress,
W73-12637 5C

BURY, R. B.
The Effects of Diesel Fuel on a Stream Fauna,
W73-12997 5C

BUSCHBOM, U.
Extreme Water Stress and Photosynthetic Activity of the Desert Plant Artemisia Herba-Alba Asso,
W73-12785 2I

BUTTON, D. K.
The Kinetics of Microbiological Modification of Organic Substances in Natural Waters,
W73-12712 5B

BYALYY, A. M.
Water Regime in a Crop Rotation on Chernozem Soils in Southeast Russia (Vodnyy rezhim v sevooborote na chernozemnykh pochvakh Yugo-Vostoka),
W73-12747 2G

CAIRNS, J. JR
Mortality Curves of Bluegills (Lepomis Macrochirus Rafinesque) Simultaneously Exposed to Temperature and Zinc Stress,
W73-12637 5C

The Use of Fish as Sensors in Industrial Waste Lines to Prevent Fish Kills,
W73-12889 5C

CALKINS, R. J.
Characterization of Chemical Sludges,
W73-12871 5A

CAMPBELL, I. R.
Biological Aspects of Lead: An Annotated Bibliography - Literature From 1950 through 1964. Parts I and II,
W73-12627 5C

CARLSON, C. P.
Fish Viruses: Histopathologic Changes Associated with Experimental Channel Catfish Virus Disease,
W73-12382 5C

CARPENA, O.
Determination of Exchangeable Cations in Calcareous Soils,
W73-12786 2G

CARSWELL, J. K.
An Improved Method For Determining Organics by Activated Carbon Adsorption and Solvent Extraction - Pt. II (Test Method),
W73-12866 5A

CARTEE, C. P.
Economic and Related Impacts of Rural Water Systems in Mississippi,
W73-12493 6B

CASSEL, A. F.
Waste Water Purification by Breakpoint Chlorination and Carbon Adsorption,
W73-12459 5D

CASTLE, W. T.
DDT Residues in White Croakers,
W73-12835 5C

CAUSO .
Turbine Design and Performance for the Mersey-Forth Hydro Power Development,
W73-12486 8C

CAZES, B.
Environmental Quality Indicators and Social Indicators,
W73-12679 6B

CERVIONE JR, M. A.
A Proposed Streamflow Data Program for Connecticut,
W73-12748 4A

CHALK, R. C.
Application of Liquid Chromatography to Pollution Abatement Studies of Munition Wastes,
W73-12877 5A

CHAMBERLAIN, L. L.
Primary Productivity in a New and an Older California Reservoir,
W73-12998 8I

CHAMBERS, J. Q.
Voltammetric Study of the Hydrogen Ion/Hydrogen Couple in Acetonitrile/Water Mixtures,
W73-12872 2K

CHAN, L.
Trace Element Trapping in Pteropod Tests,
W73-12937 5B

CHAN, S. T. K.
Finite Element Shallow Lake Circulation Analysis,
W73-12413 2H

CHAPMAN, D. W.
Effects of Zectran Insecticide on Aquatic Organisms in Bear Valley Creek, Idaho,
W73-12634 5C

CHAPMAN, G.
Effect of Heavy Metals on Fish,
W73-12611 5C

CHARLTON, R. B.
On The Number Distribution of Hail Growing in Updrafts,
W73-12602 2B

CHATTOPADHYAY, S. B.
Effect of Soil Moisture on the Growth of Macrophomina Phaseoli, Sclerotium Rolfsii and Fausarium Solani in Soil,
W73-12831 3F

CHEN, R. L.
Gas Production in Sediments of Lake Mendota, Wisconsin,
W73-12378 5C

Nitrification in Sediments of Selected Wisconsin Lakes,
W73-12763 5C

CHILDERS, J. M.
Channel Erosion Surveys Along Proposed Taps Route, Alaska, July 1971,
W73-12957 2J

CHISHOLM, W. O.
Extreme Roughness of Natural River Channel,
W73-12416 8B

CHIU, S. Y.
ATP Pools in Pure and Mixed Cultures,
W73-12887 5A

CHOATE, J. S.
Effects of Stream Channeling on Wetlands in a Minnesota Watershed,
W73-12667 4A

CHOW, A.
The Monitoring of Organic Matter with Polyurethane Foam,
W73-12868 5A

CHOW, T. J.
Lead Pollution: Records in Southern California Coastal Sediments,
W73-12589 5B

CHUAPOHUCK, W.
Reuse of Human Wastes in Agriculture,
W73-12817 5D

CLARK, T. L.
Dynamics of a Falling Particle Zone,
W73-12603 2B

CLARY, W. P.
A Treatment Prescription for Improving Big Game Habitat in Ponderosa Pine Forests,
W73-12406 4D

CLEMANS, C. L.
An Electric Conversion for Mechanical Hydraulic Governors of Water Wheel Turbines,
W73-12469 8C

CLEWELL, D. H.
Petroleum...40 Years of Research,
W73-12768 3E

CLOSE, D. A.
Sensitivity and Detectability Limits for Elemental Analysis by Proton-Induced X-Ray Fluorescence with a 3 Mv Van de Graaff,
W73-12935 5A

COBB, D. A.
Horton's 1945 Study: A Cartobibliography,
W73-12596 7C

CODDINGTON, A.
Notes on Information and Administrative Costs in the Theory of Externalities,
W73-12678 6B

Some Limitations of Benefit-Cost Analysis in Respect of Programmes with Environmental Consequences,
W73-12682 6B

COFFEE, R.
Electrostatic Crop Spraying,
W73-12482 3F

COLEMAN, J. M.
Process-Form Variability of Multiclass Coasts: Baja California,
W73-12422 2L

COLLIN, M. L.
An Evaluation of Baltimore Harbor Land Use Potentials,
W73-12361 6B

COLWELL, B.
A Pilot Fish-Pond System for Utilization of Sewage Effluents, Humboldt Bay, Northern California,
W73-12434 5D

COLWELL, R. R.
A Study of Inorganic Salts Requirements and Effect on the Morphology of Marine Bacteria,
W73-12628 5C

COMISKEY, C. E.
Fishes of the Big South Fork of the Cumberland River,
W73-12820 4C

CONNOLLY, J. J.
High Speed A-D Converters in a Memory Test System,
W73-12891 7C

CONVERSANO, G.
A Pilot Fish-Pond System for Utilization of Sewage Effluents, Humboldt Bay, Northern California,
W73-12434 5D

CONWAY, R. A.
Identification and Control of Petrochemical Pollutants Inhibitory to Anaerobic Processes,
W73-12513 5D

COOBER, N. H.
Evaluation of Environmental Intangibles,
W73-12688 6B

COOK, J. G.
Here's a New Sand Pack Method,
W73-12761 8G

COOKE, R.
Experimental Investigation of Rock Weathering by Salts,
W73-12733 2K

COOPER, W. J.
The Evaluation of Existing Field Test Kits for Determining Free Chlorine Residuals in Aqueous Solutions,
W73-12426 5A

COPPERSMITH, S. B.
Impact of Water Fluoridation on Dental Practice and Dental Manpower,
W73-12816 5F

CORDONE, A. J.
Exploratory Bottom Trawling in Lake Victoria,
W73-12803 2H

CORNFIELD, A. H.
Effect of Level of Soil Moisture on Nitrogen Mineralization and Nitrification During Incubation of East Pakistan Tea Soils,
W73-12799 3F

COTO, S.
On The Water Pollution in the Area of Urban Development (In Japanese),
W73-12996 5B

COUGHLIN, R. E.
Stream Quality Preservation Through Planned Urban Development,
W73-12518 5G

COX, R. G.
Effective Hydraulic Roughness for Channels Having Bed Roughness Different from Bank Roughness; A State-Of-The-Art Report,
W73-12565 8B

CRAVEN, S. E.
Carbon Cycle in Sediment-Water Systems,
W73-12846 5C

CRAWFORD, G. W.
Annual Production of a Stream Mayfly Population: A Comparison of Methods,
W73-12905 5B

CROOM, H. C.
System for Removing Color From Paper Mill Liquid Waste,
W73-12445 5D

CROSBY, J. W. III
Physical Characteristics of Basalt Aquifers,
W73-12523 4B

CROWDY, S. H.
Water Pathways in Higher Plants: II. Water Pathways in Roots,
W73-12651 2I

Water Pathways in Higher Plants: III. The Transpiration Stream Within Leaves,
W73-12652 2I

CTVRTNICEK, T.
Study of Utilization and Disposal of Lime Sludges Containing Phosphates,
W73-12501 5D

CULLEN, P. W.
The Effect of Irrigation Depth on Root Growth of Some Pasture Species,
W73-12834 3F

CUMBERLAND, J. H.
The Role of Uniform Standards in International Environmental Management.
W73-12686 6B

CUMMINS, K. W.
Energetics of Natural Populations of Freshwater Macroconsumers,
W73-12374 5C

The Utilization of Leaf Litter by Stream Detritivores,
W73-12882 5C

CUNFER, B.
Influence of Water Potential on Growth, Antibiotic Production and Survival of Cephalosporium gramineum,
W73-12999 5B

CUNNINGHAM, G. L.
A Comparison of Rates of Water Loss Through Transpiration of Several Southern New Mexico Phreatophyte Species,
W73-12497 2D

CURL JR, H. C.
A Mathematical Model of the Nutrient Dynamics of Phytoplankton in a Nitrate-Limited Environment,
W73-12915 5C

CURRY, L.
Insecticide Residues in Water and Sediment from Cisterns on the U.S. and British Virgin Islands - 1970,
W73-12894 5B

CUTSHALL, N. H.
Heavy Metals in Estuaries and the Coastal Zone,
W73-12606 5B

DAHLGREN, R. B.
Effects of Stress on Pheasants Previously Given Polychlorinated Biphenyls,
W73-12995 5C

DAHLMAN, R. C.
Flow of Microbially Fixed Nitrogen in a Model Ecosystem,
W73-12847 5B

DALPKE, H-L.
Investigations on Waste Water Clarification with Activated Carbon (Untersuchungen zur Restabwasserklarung mit Aktivkohle),
W73-12543 5D

DAN, J.
Sodium-Affected Soils in the Jordan Valley,
W73-12795 2G

DANIEL, T. C.
Measuring Public Responses to Vegetative Management,
W73-12408 4D

DANNINGER, H.
Methods for the Further Improvement of Spent Liquor Recovery in Lenzing,
W73-12524 5D

DAUBEN, D. L.
Micellar Solutions Stimulate Wells,
W73-12762 8B

DAVENPORT, D. C.
Antitranspirant Film: Curtailing Intake of External Water by Cherry Fruit to Reduce Cracking,
W73-12992 2D

Antitranspirants for Conservation of Leaf Water Potential of Transplanted Citrus Trees,
W73-12993 2D

Relative Water Content of Leaves: Underestimation Caused by Antitranspirant Film,
W73-12994 2D

DAVIDSON, L. W.
Bearing Capacity of Footings in Plane Strain,
W73-12484 8D

DAVIES, J.
Heat and Water Balance Studies on Grand Cayman,
W73-12822 2D

DAVIES, W. E.
Buffalo Creek Dam Disaster: Why It Happened,
W73-12411 4C

DAVIS, A. W.
An Immobilized Cholinesterase Product for Use in the Rapid Detection of Enzyme Inhibitors in Air or Water,
W73-12901 5A

DAYTON, P. K.
Dispersion, Dispersal, and Persistence of the Annual Intertidal Alga, Postelsia Palmeformis Ruprecht,
W73-12883 5C

DE ANGELIS, F.
Process and Apparatus for Removing Mercury from Waste Water,
W73-12449 5D

DE PAIVA, H. A. R.
Strength Analysis of Corner Column-Slab Connections,
W73-12465 8A

DEAN, B. T.
The Design and Operation of Deep-Well Disposal System,
W73-12780 5E

DEGENS, E. T.
Aspects of the Biogeochemistry of Carbohydrates and Proteins in Aquatic Environments,
W73-12371 5C

DEGURSE, P. E.
Mercury Levels in Wisconsin Fish and Wildlife,
W73-12812 5A

DELLINGER, T. B.
Diamond-Bit Research Provides Basic Drilling Parameters,
W73-12764 8B

DENISOV, G. A.
Flotation Machine with Vertically Reciprocating Aerators,
W73-12452 5D

DENNIS, H. W.
Salt Pollution of a Shallow Aquifer--Indianapolis, Indiana,
W73-12940 5B

DERR, S. K.
Biologically Active Compounds in the Aquatic Environment: The Uptake and Distribution of (1,1-Dichloro-2,2-Bis (P-Chlorophenyl) Ethylene), DDE by Chironomus tentans Fabricius (Diptera: Chironomidae),
W73-12804 5B

DESHPANDE, P. B.
Soluble Silica and Fluoride in Some Surface and Ground Waters of Mysore State,
W73-12969 2K

DEUBLER, E. E. JR
A Hydrographic Atlas of Larger North Carolina Sounds,
W73-12948 2L

DIANA, G.
Energy Method for Computing the Amplitude of Vibration of Conductor Bundles Due to Wake Effect,
W73-12480 8C

DICKMAN, M.
Some Effects of Artificial Fertilization on Enclosed Plankton Populations in Marion Lake, British Columbia,
W73-12384 5C

DICKSON, K. L.
Some Effects of Evaporation Suppression on Reservoir Ecology,
W73-12869 5C

DICKSON, R. E.
Effects of Aeration, Water Supply, and Nitrogen Source on Growth and Development of Tupelo Gum and Bald Cypress,
W73-12923 2I

Nutrient Uptake by Tupelo Gum and Bald Cypress from Saturated or Unsaturated Soil,
W73-12828 2I

DIKIKH, A. N.
Snow Cover of the Issyk-kul' Depression and Its Alpine Environment (Snezhnyy pokrov Issyk-Kul'skoy kotloviny i yeye vysokogornogo obramleniya),
W73-12726 2C

DOBBS, T. L.
Public Support of Private Water Resource Development in Agriculture--With Implications for Firm Growth,
W73-12698 4B

DOLAN, R.
Classification of Coastal Environments, Procedures and Guidelines,
W73-12433 2L

Classification of the Coastal Environments of the World: Part II. Africa,
W73-12950 2L

DONALDSON, A. L. JR
Here's a New Sand Pack Method,
W73-12761 8G

DONG, A. E.
Water Quality in the Middle Fork Feather River, California, May 1970 Through September 1971,
W73-12720 5A

DOUGLAS, B. L.
Impact of Water Fluoridation on Dental Practice and Dental Manpower,
W73-12816 5F

DOWNEY, J. S.
Ground-Water Resources, Nelson and Walsh Counties, North Dakota,
W73-12578 2F

DOWNING, E. P.
Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol II - Biology,
W73-12754 2H

DRUMMOND, R. A.
Some Short-Term Indicators of Sublethal Effects of Copper on Brook Trout, Salvelinus Fontinalis,
W73-12859 5C

DURRANI, S. M. A.
Reuse of Human Wastes in Agriculture,
W73-12817 5D

DURY, G. H.
Climatic Change and Arrested Meander Development on the River Severn,
W73-12737 4A

DUSANSKY, R.
Externalities, Welfare, And the Feasibility of Corrective Taxes,
W73-12694 6B

DUSEJA, D. R.
Herbicide Contamination of Surface Runoff Waters,
W73-12511 5B

DUTTA, T. R.
Evaluation of Herbicides for Submerged Weeds in Chambal and Bhakra-Nangal Canal Systems,
W73-12738 5G

DYSART, B. C. III
Mathematical Modeling for Environmental Pollution Control,
W73-12711 5G

DYSART, BENJAMIN C. III
Determination of Public Environmental Preferences in Water Resources Planning and Development,
W73-12706 6B

EFFORD, I. E.
Some Effects of Artificial Fertilization on Enclosed Plankton Populations in Marion Lake, British Columbia,
W73-12384 5C

EGAN, W.
Water Quality Determinations in the Virgin Islands from ERTS-A Data,
W73-12630 5A

EL-HADIDI, S.
Well Logs can Indicate Formation Drillability,
W73-12769 8E

ELFVING, D. C.
Diurnal and Seasonal Effects of Environment on Plant Water Relations and Fruit Diameter of Citrus,
W73-12805 3F

Evaluation of Tensiometers for Estimating Plant Water Stress in Citrus,
W73-12985 3F

ELIASSON, J.
Convective Ground Water Flow,
W73-12722 2F

Ground Water Models With Parallel Linear Reservoirs,
W73-12723 2F

ELLIS, C. M. A.
The Size at Maturity and Breeding Seasons of Sardines in Southern Lake Tanganyika,
W73-12649 2H

EMMERT, F. H.
Effect of Time, Water Flow and pH on Centripetal Passage of Radiophosphorus Across Roots of Intact Plants,
W73-12991 5B

ERICKSON, L. E.
ATP Pools in Pure and Mixed Cultures,
W73-12887 5A

ERNST, C. H.
Fishes of the Yellow Medicine River in Southwestern Minnesota,
W73-12821 2I

ETNIER, D. A.
Fishes of the Big South Fork of the Cumberland River,
W73-12820 4C

EVANS, I.
Experimental Investigation of Rock Weathering by Salts,
W73-12733 2K

EVANS, J. O.
Herbicide Contamination of Surface Runoff Waters,
W73-12511 5B

EVANS, L. V.
Correlated Light and Electron Microscope Studies on Brown Algae. II. Physode Production in Dictyota,
W73-12388 5C

EVENARI, M.
Extreme Water Stress and Photosynthetic Activity of the Desert Plant Artemisia Herba-Alba Asso,
W73-12785 2I

EVILEVICH, M. A.
Selection of a Suitable System of Effluent Purification (O vybore ratsional'noi sistemy ochistki stochnykh vod),
W73-12673 5D

FAGER, E. W.
Estimation of Mortality Coefficients from Field Samples of Zooplankton,
W73-12906 5C

FAHLBUSCH, F.
Hydrological Reservoir Design Using Basic Systems Theory Techniques,
W73-12471 8A

FAIRHURST, S. P.
Behavior of the Goldfish as an Early Warning System for the Presence of Pollutants in Water,
W73-12916 5A

FAN, E. C. Y.
Method of Reducing Phenolic Waste,
W73-12447 5D

FAN, L. T.
ATP Pools in Pure and Mixed Cultures,
W73-12887 5A

FARMER, I. W.
Leaching of Cement from a Concrete Pile Section by Groundwater Flow,
W73-12766 8F

FARODA, A. S.
Cenchrus Ciliaris--A Perennial Pasture Grass of Arid and Semi-Arid Areas,
W73-12790 4A

FEDOTOV, A. M.
Flotation Machine with Vertically Reciprocating Aerators,
W73-12452 5D

FEELER, V. H.
Neutralization of Metal Containing Wastes,
W73-12462 5D

FENTERS, J.
Viruses in Metropolitan Waters: Concentration by Polyelectrolytes, Freeze Concentration, and Ultrafiltration,
W73-12867 5F

FENWICK, G. B.
Chena River Lakes Project, Alaska, Problems Relating to Channel Development, Erosion, and Bank and Levee Protection,
W73-12559 8B

FERNANDEZ, F. J.
An Improved AA Microsampling System,
W73-12865 5A

FILBY, R. H.
Problems in the Analysis of Trace Metals,
W73-12608 5A

FINCHAM, A. A.
The Association of Amphipods in the Shallow-Water Sand Habitat of Strangford Lough, Co. Down,
W73-12879 5A

FINGER, R.
Spectrophotometric Determination of Ammonia,
W73-12886 5A

FISH, I. L.
The Visual Aspects of Resource Management,
W73-12407 4D

FLACK, J. E.
New Techniques for Participative Planning in Water Resources,
W73-12472 6B

FLIPPIN, R. S.
Degradation of Methylmercury by Bacteria Isolated from Environmental Samples,
W73-12620 5A

FLUORIE, E. J.
Particulate Manganese in Sea Water Stressing Regimes in Marine Anoxic Basins,
W73-12854 5A

FLYNT, T. O.
Auger Soil Sampler for Herbicide Residues,
W73-12794 2G

FOCHTMAN, E. G.
Lithium Silicate Sedimentation Tracer for Shoal Deposit Studies,
W73-12862 5B

FOLK, R. L.
Black Phytokarst From Hell, Cayman Islands, British West Indies,
W73-12593 2J

FONTANE, D. G.
Mathematical Simulation of the Turbidity Structure within an Impoundment; Hydraulic Laboratory Investigation,
W73-12562 8B

FONTES, J-C.
Environmental Isotopes and Circulation in Aquifers Under Venice (Isotopes du Milieu et Circulations dans les Aquiferes du Sous-Sol Venitien),
W73-12419 2F

FOSBERG, M. A.
Theory of Precipitation Effects on Dead Cylindrical Fuels,
W73-12381 2B

FOSTER, G. R.
Stone and Woodchip Mulches for Erosion Control on Construction Sites,
W73-12463 4D

FOX, R. D.
Recondition and Reuse of Organically Contaminated Waste Sodium Chloride Brines,
W73-12521 5D

FRALICK, R. A.
Ecological Studies of Codium fragile in New England, USA,
W73-12918 5C

FRANCO, J. J.
Effects of Submerged Sills in the St. Clair River; Hydraulic Model Investigation,
W73-12572 8B

Shoaling Conditions, St. Louis Harbor, Mississippi River; Hydraulic Model Investigation,
W73-12570 8B

FRASER, J. G.
A Comparison of Rates of Water Loss Through Transpiration of Several Southern New Mexico Phreatophyte Species,
W73-12497 2D

FREI, R. W.
pH-Sensitive Fluorogenic Spray Reagents: II. Quantitative Studies with Pesticides,
W73-12727 5A

FREIMARK, S. J.
Behavior of the Goldfish as an Early Warning System for the Presence of Pollutants in Water,
W73-12916 5A

FREY, R. W.
Characteristic Physical and Biogenic Sedimentary Structures in Georgia Estuaries,
W73-12410 2L

FRIEDLANDER, S. K.
Transport of Heavy Metals Through the Air Environment,
W73-12609 5B

FRIEDMAN, E. J.
Laser Induced Fluorescence in Algae: A New Technique for Remote Detection,
W73-12841 5A

FRIERY, R. N.
A Study of Selected Aspects of Rural Water System Development in Mississippi,
W73-12492 6B

FROLOV, M. V.
Determination of Melamine-Formaldehyde Resin in White Waters (Opredelenie soderzhaniya melamino-formaldegidnoi smoly v podsetochnykh vodakh),
W73-12672 5A

FRONING, H. R.
Micellar Solutions Stimulate Wells,
W73-12762 8B

FUJII, K.
Simulation Study of Phytoplankton Photosynthesis and Growth in the Fraser River Estuary,
W73-12919 5C

FURUSAWA, F.
Protein Content of Brown Rice by Upland Polyethylene Film Mulching Culture, (In Japanese),
W73-12806 3F

GAGE, J.
Community Structure of the Benthos in Scottish Sea-Lochs. II. Spatial Pattern,
W73-12855 5C

GAINES, J. L. JR
Aeromonas-Induced Deaths Among Fish and Reptiles in an Eutrophic Inland Lake,
W73-12633 5C

GALLAGHER, R. H.
Finite Element Shallow Lake Circulation Analysis,
W73-12413 2H

GARBER, R. H.
Influence of Certain Rotations Upon Cotton Production in the San Joaquin Valley,
W73-12975 3F

GARG, S. P.
Rational Design of Well Screens,
W73-12771 8B

GARNER, J. K.
Identification of Water Resources Planning Problems in the Metropolitan Area of Greater San Antonio and Its Associated Counties,
W73-12354 6B

GASPARETTO, M.
Energy Method for Computing the Amplitude of Vibration of Conductor Bundles Due to Wake Effect,
W73-12480 8C

GEEKIE, A. D.
Community Structure of the Benthos in Scottish Sea-Lochs. II. Spatial Pattern,
W73-12855 5C

GEMAEHLING, C.
The Multipurpose Development of the River Rhone Valley,
W73-12467 4A

GENTRY, R. E.
Preimpoundment Study of West Point Lake, Georgia,
W73-12376 5C

GEORGE, L. C.
Neutralization of Metal Containing Wastes,
W73-12462 5D

GERMANA, A.
Heat-Exchanger for Desalting Sea Water,
W73-12453 3A

GESSER, H. D.
The Monitoring of Organic Matter with Polyurethane Foam,
W73-12868 5A

GHASSEMI, M.
Water Decolorization,
W73-12446 5D

GHOSH, P. K.
Water Metabolism in Desert Sheep, Effects of Various Degrees of Water Restriction on the Distribution of Body Water in Mariwari Sheep,
W73-12788 3F

GIBBONS, G. O.
Rearing Channel Catfish Fingerlings Under Intensive Culture Conditions,
W73-12488 8I

GIBBS, I.
Determination of Lead in Petroleum Additives Using Atomic Absorption Spectrophotometry,
W73-12864 5A

GIBSON, H. R.
Effects of Zectran Insecticide on Aquatic Organisms in Bear Valley Creek, Idaho,
W73-12634 5C

GIGLIOLI, M. E. C.
Heat and Water Balance Studies on Grand Cayman,
W73-12822 2D

GILLESPIE, D. C.
A Relationship between Heterotrophic Utilization of Organic Acids and Bacterial Populations in West Blue Lake, Manitoba,
W73-12903 5C

GILLEY, JAMES E.
Environmental Cost of Mining,
W73-12687 5G

GLANCY, P. A.
Sources of Data for Evaluation of Selected Geothermal Areas in Northern and Central Nevada,
W73-12947 4B

GLOVER, J. E.
Effects of Submerged Sills in the St. Clair River; Hydraulic Model Investigation,
W73-12572 8B

GOLDEN, H. G.
Preliminary Flood-Frequency Relations for Small Streams in Georgia,
W73-12946 4A

GOLDING, D. L.
Estimating Snow-Water Equivalent from Point-Density Measurements of Forest Stands,
W73-12827 4A

GOLDMAN, C. R.
Optical Properties and Color of Lake Tahoe and Crater Lake,
W73-12926 5A

GOLDMAN, JOEL C.
The Effect of Inorganic Carbon on Eutrophication,
W73-12392 5C

GOLITSYNA, YE. F.
Investigation of Thermal Properties of Soils in the Don River Basin for Estimation of Snowmelt Losses to Infiltration Into Frozen Soil (Issledovaniye teplovykh svoystv pochv basseyna r. Dona dlya otsenki poter' talykh vod na in fil'tratsiyu v merzluyu pochvu),
W73-12436 2G

GOODNOW, R. A.
Bacterial Degradation of Detergent Compounds,
W73-12938 5B

GOODSON, L. H.
An Immobilized Cholinesterase Product for Use in the Rapid Detection of Enzyme Inhibitors in Air or Water,
W73-12901 5A

GOODWIN, D. L.
The Interrelationships of the Vegetation Characters of Four Salt Desert Shrub Associations of Colorado Plateau,
W73-12791 3B

GORCZYCA, M.
Construction Costs of Water Supply and Sewage Networks in Poland--1961-1970,
W73-12703 6C

GORDON, R. W.
Detoxification of Kraft Pulp Mill Effluent by an Aerated Lagoon,
W73-12529 5D

GORHAM, E.
Stratigraphy of Fossil Pigments as a Guide to the Postglacial History of Kirchner Marsh, Minnesota,
W73-12386 5C

GOUDIE, A.
Experimental Investigation of Rock Weathering by Salts,
W73-12733 2K

GOULD, J. R.
Extinction of a Fishery by Commercial Exploitation: A Note,
W73-12692 6B

GOWAIKAR, A. S.
Influence of Moisture Regime on the Genesis of Laterite Soils in South Inida: II. Clay Composition and Mineralogy,
W73-12721 2G

GOYER, R. A.
Trisodium Nitrilotriacetate in Drinking Water: Metabolic and Renal Effects in Rats,
W73-12982 5C

GRACE, J. L. JR
Mathematical Simulation of the Turbidity Structure within an Impoundment; Hydraulic Laboratory Investigation,
W73-12562 8B

Selective Withdrawal from Man-Made Lakes, Hydraulic Laboratory Ivestigation,
W73-12569 4A

GRAETZ, D. A.
Gas Production in Sediments of Lake Mendota, Wisconsin,
W73-12378 5C

GRAINGER, J. M.
Microbiology in the Aerobic Treatment of Farm Waste,
W73-12890 5D

GRANT, H.
Heated Sensors for Flow Measurements,
W73-12618 7B

GREENFIELD, R. J.
New Applications of Geophysical Methods to Ground-Water Problems in Pennsylvania,
W73-12783 2F

GRENNEY, W. J.
A Mathematical Model of the Nutrient Dynamics of Phytoplankton in a Nitrate-Limited Environment,
W73-12915 5C

GRIEVE, R. E.
A Comparison of Rates of Water Loss Through Transpiration of Several Southern New Mexico Phreatophyte Species,
W73-12497 2D

GROAT, C. G.
Presidio Bolson, Trans-Pecos Texas and Adjacent Mexico: Geology of a Desert Basin Aquifer System,
W73-12585 2F

GUTER, K. J.
The Evaluation of Existing Field Test Kits for Determining Free Chlorine Residuals in Aqueous Solutions,
W73-12426 5A

GUTTERMAN, Y.
Delayed Seed Dispersal and Rapid Germination as Survival Mechanisms of the Desert Plant Blepharis Persica (Burm.) Kuntze,
W73-12787 2I

GUY, L. L. JR
WPCF Project Report: A State Certification Program Guide,
W73-12842 5G

HAGAN, R. M.
Antitranspirant Film: Curtailing Intake of External Water by Cherry Fruit to Reduce Cracking,
W73-12992 2D

Antitranspirants for Conservation of Leaf Water Potential of Transplanted Citrus Trees,
W73-12993 2D

HAHN, P. B.
Sodium Tungsten Bronze as a Potentiometric Indicating Electrode for Dissolved Oxygen in Aqueous solution,
W73-12873 5A

HALE, V. Q.
Sodium Relations in Desert Plants: 1. Cation Contents of Some Plant Species from the Mojave and Great Basin Deserts,
W73-12792 2I

HALL, D. J.
Sugar-Coated Daphnia: A Preservation Technique for Cladocera,
W73-12910 5A

HAMILTON, D. H. JR
Biomass Characteristics of the Asidian Molgula Manhattensis (Dekay),
W73-12880 5A

HAMMER, T. R.
Stream Quality Preservation Through Planned Urban Development,
W73-12518 5G

HANCE, R. J.
The Effect of Adsorbents on the Rate of Degradation of Herbicides Incubated with Soil,
W73-12656 5B

HANSEN, L. D.
Stabilization of Sewage Solids by the Channel Aeration Process,
W73-12502 5D

HARADA, S.
Salmonella Contamination of Rivers and Sewages in Fukuyama City, (In Japanese),
W73-12648 5C

HARLAN, R. L.
Estimating Snow-Water Equivalent from Point-Density Measurements of Forest Stands,
W73-12827 4A

HARLEMAN, D. R. F.
Prediction of Unsteady Salinity Intrusion in Estuaries: Mathematical Model and User's Manual,
W73-12728 2L

HARLEMEN, D. R. F.
The Computation of Tides and Currents in Estuaries and Canals,
W73-12428 2L

HARRILL, J. R.
Evaluation of the Water Resources of Lemmon Valley, Washoe County, Nevada, With Emphasis on Effects of Ground-Water Development to 1971,
W73-12718 4B

Sources of Data for Evaluation of Selected Geothermal Areas in Northern and Central Nevada,
W73-12947 4B

HARRIS, A. H.
Mariculture in Estuarine Oil-Pipeline Canals in Louisiana,
W73-12951 5C

Standing Crops of Natural Fish Populations in Brackish-Water Oil Field Pipeline Canals,
W73-12952 5C

HARRIS, R. F.
Phosphate Chemistry in Lake Sediments,
W73-12917 5C

HARRISON, A. P. JR
Bacterial Degradation of Detergent Compounds,
W73-12938 5B

HARRISON, D. L.
DDT in Some New Zealand Marine and Freshwater Fauna,
W73-12925 5A

HARRISON, W.
Forecasting Storm-Induced Beach Changes Along Virginia's Ocean Coast,
W73-12584 4A

HARTSHORN, J. H.
Glacial Environment and Processes in Southeastern Alaska,
W73-12423 2C

HASHIMOTO, H.
Salmonella Contamination of Rivers and Sewages in Fukuyama City, (In Japanese),
W73-12648 5C

HASSAN, J. E.
Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol II - Biology,
W73-12754 2H

HATAZAWA, N.
On The Water Pollution in the Area of Urban Development (In Japanese),
W73-12996 5B

HAY, R. K. M.
Characterization of Exudation from Excised Roots of Onion, Allium Cepa: I. Water Flux,
W73-12989 3F

HAYDEN, B.
Classification of the Coastal Environments of the World: Part II. Africa,
W73-12950 2L

HAYDEN, B. P.
Classification of Coastal Environments, Procedures and Guidelines,
W73-12433 2L

HAYWARD, J.
Studies on the Growth of Phaeodactylum Tricornutum. II. The Effect of Organic Substances on Growth,
W73-12389 5C

HAZARD, J. L.
Toward a Regional Policy for the Great Lakes,
W73-12963 6B

HEALY, K. A.
Factors Affecting the Percolation Test,
W73-12716 5B

HEIFETZ, S. B.
Effect of School Water Fluoridation on Dental Caries: Final Results in Elk Lake, Pa., After 12 years,
W73-12647 5C

HEITMULLER, P. T.
A Cage for Exposing Aquatic Animals to Bottom Sediments,
W73-12372 2L

HELLAWELL, J. M.
The Growth, Reproduction and Food of the Roach Rutilus rutilus (L.), of the River Lugg, Herefordshire,
W73-12921 8I

HENDEY, N. I.
Some Marine Diatoms from the Galapagos Islands,
W73-12902 2I

HENDZEL, L. L.
A Relationship between Heterotrophic Utilization of Organic Acids and Bacterial Populations in West Blue Lake, Manitoba,
W73-12903 5C

HERMAN, R. L.
Fish Viruses: Histopathologic Changes Associated with Experimental Channel Catfish Virus Disease,
W73-12382 5C

HERMSMEIER, L. F.
Field Leaching by Sprinkler and Surface Irrigation During a Crop Season,
W73-12464 3F

HERRMANN, F. A. JR
Navigation Channel Improvement, Gastineau Channel, Alaska; Hydraulic Model Investigation,
W73-12571 8A

HICKMAN, G. D.
Laser Induced Fluorescence in Algae: A New Technique for Remote Detection,
W73-12841 5A

HIGGINS, P. M.
A Symposium on the Preservation and Multiple-Use Problems in the Great Lakes,
W73-12962 5C

HILL, D. W.
Preimpoundment Study of West Point Lake, Georgia,
W73-12376 5C

HILMER, R. M.
Instrumental and Numerical Considerations for On-Line Interpretation of High Resolution Mass Spectral Data,
W73-12874 2K

HILTON, M. C.
Use of Coliphages as Indicators of Water pollution,
W73-12525 5A

HIRATA, Y.
Salmonella Contamination of Rivers and Sewages in Fukuyama City, (In Japanese),
W73-12648 5C

HOAG, LYLE N.
Nutrient Control in North San Francisco Bay;
W73-12398 5C

HOBBA, L. J.
A Suggested New Approach to the Analysis of Drainage Basin Shapes,
W73-12729 4A

HOGAN, J. W.
Use of Cold Brands on Channel Catfish,
W73-12778 8I

HOLDING, A. J.
Gas Production in Sediments of Lake Mendota, Wisconsin,
W73-12378 5C

HOLLIGAN, M. S.
Correlated Light and Electron Microscope Studies on Brown Algae. II. Physode Production in Dictyota,
W73-12388 5C

HOLLIS, J. P.
Aqueous Iron-Sulfur Systems in Rice Field Soils of Louisiana,
W73-12385 3F

HOLLMAN, K. W.
The Effect of Price and Other Selected Variables on Water Consumption,
W73-12495 6B

HOLMES, P.
Phytoplankton Algae: Nutrient Concentrations and Growth,
W73-12924 5C

HOLT, V. I.
The Utilization of Leaf Litter by Stream Detritivores,
W73-12882 5C

HORNBERGER, G. M.
Phytoplankton Algae: Nutrient Concentrations and Growth,
W73-12924 5C

HORNE, ALEXANDER J.
Nitrogen: Recent Studies on the Role of Nitrogen in the Biostimulation and Eutrophication of Aquatic Ecosystems,
W73-12393 5C

HOROWITZ, H. S.
Effect of School Water Fluoridation on Dental Caries: Final Results in Elk Lake, Pa., After 12 years,
W73-12647 5C

HOVIOUS, J. C.
Identification and Control of Petrochemical Pollutants Inhibitory to Anaerobic Processes,
W73-12513 5D

HOWARD, F. O.
The Utilization of Leaf Litter by Stream Detritivores,
W73-12882 5C

HOWARD, J. D.
Characteristic Physical and Biogenic Sedimentary Structures in Georgia Estuaries,
W73-12410 2L

HSU, S-A.
Heat and Water Balance Studies on Grand Cayman,
W73-12822 2D

HUETING, R.
The Set up of the Statistical System Within Which the Deterioration of the Human Environment will be Estimated,
W73-12681 6B

HUFEN, T. H.
Tritium Measurement of Natural Waters on Oahu, Hawaii: A Preliminary Interpretation (Sampling Period: July 1969 to June 1970),
W73-12499 5A

HUGHES, J. L.
Selected Data on Wells in the Barstow Area, Mojave River Basin, California,
W73-12421 4B

HULL, A. N.
Climatology of Rainfall Probabilities for Oahu, Hawaii,
W73-12587 2B

HUNSIGI, G.
Consumptive Use of Water by Cotton Grown in Transition Tract of Dharwar Under Rainfed Conditions,
W73-12988 3F

HUNT, P. C.
The Profundal Fauna of Llyn Tegid, North Wales,
W73-12823 2I

HUNTZINGER, T. L.
Coordination of Agricultural and Urban Water Quality Management in the Utah Lake Drainage Area,
W73-12508 5G

IBRAHIM, K. M.
The Interrelationships of the Vegetation Characters of Four Salt Desert Shrub Associations of Colorado Plateau,
W73-12791 3B

ICANBERRY, J. W.
Quantitative Sampling of Live Zooplankton With a Filter-Pump System,
W73-12911 5A

INOUE, H.
Influence of Land Reclamation and Waste Water from Paper Mill on Environment of 'Nori' (Porphyra Tenera) Culture Farm, (In Japanese),
W73-12639 5C

IRTEGOV, V. V.
An Efficient Method of Dewatering Effluent Sediments (Effektivnyi Sposob Obezvozhivaniya Osadkov Stochnikh Vod),
W73-12674 5E

ISHAQUE, M.
Effect of Level of Soil Moisture on Nitrogen Mineralization and Nitrification During Incubation of East Pakistan Tea Soils,
W73-12799 3F

ISOM, B. G.
Mussels in the Unique Nickajack Dam Construction Site, Tennessee River, 1965,
W73-12800 2I

ITO, J.
A Record of Pacific Herring (Clupea harengus Pallasi) Feeding on Juvenile Chinook Salmon (Oncorhynchus tshawytscha) in a British Columbia Estuary,
W73-12375 2L

ITO, S.
Ecological Information on the Differences in the Number of Culex tritaeniorhynchus Larvae Among Paddy Fields (In Japanese),
W73-12829 3F

IVANOVA, N. A.
Methods of Determining Soil Moisture Storage in Winter (K metodike opredeleniya vlagozapasov pochvy v zimniy period goda),
W73-12444 2G

IZATT, J. B.
Lake Movements with Partial Ice Cover,
W73-12663 2H

JACKSON, P. B. N.
The African Great Lakes Fisheries: Past, Present and Future,
W73-12646 8I

JACOBS, W. B.
An Immobilized Cholinesterase Product for Use in the Rapid Detection of Enzyme Inhibitors in Air or Water,
W73-12901 5A

JALIL, M.
Parasitism of Mosquitoes by Water Mites,
W73-12987 2I

JANNASCH, H. W.
Bacterial Content of Particulate Matter in Offshore Surface Waters,
W73-12912 5B

JOHANNSSON, S.
Ground Water Models With Parallel Linear Reservoirs,
W73-12723 2F

JOHANSSON, N.
Metabolic Effects of PCB (Polychlorinated Biphenyls) on the Brown Trout (Salmo trutta),
W73-12819 5C

JOHNSON, C. B.
Stone and Woodchip Mulches for Erosion Control on Construction Sites,
W73-12463 4D

JOHNSON, C. M.
Nutrient Uptake by Tupelo Gum and Bald Cypress from Saturated or Unsaturated Soil,
W73-12828 2I

JOHNSON, D. C.
Sodium Tungsten Bronze as a Potentiometric Indicating Electrode for Dissolved Oxygen in Aqueous solution,
W73-12873 5A

JOHRI, P. N.
Concentration of Fluorine in Potable Water in Bihar Plateau: A Preliminary Survey,
W73-12645 5A

JONES, A. C.
Contributions to the Life History of the Piute Sculpin in Sagehen Creek, California,
W73-12986 2I

JONES, D. C.
An Investigation of the Nitrate Problem in Runnels County, Texas,
W73-12514 5B

JONES, D. O.
Real-Time Interactive Instrumentation,
W73-12850 7A

JONES, J. W.
The Profundal Fauna of Llyn Tegid, North Wales,
W73-12823 2I

JONES, P. W.
Photosulfoxidation of Hydrocarbons in the Liquid Phase,
W73-12833 2K

JOY, C. S.
Reservoir-Yield Estimation Procedures,
W73-12478 4A

JOYCE, J. C.
Stream-Velocity Effects on the Heavy-Metal Concentrations,
W73-12870 5B

JUSZLI, M.
Determination of Lead in Petroleum Additives Using Atomic Absorption Spectrophotometry,
W73-12864 5A

KABLE, P. F.
Viruses Infecting Peaches in the Murrumbidgee Irrigation Areas of New South Wales,
W73-12981 3F

KADDAH, M. T.
Field Leaching by Sprinkler and Surface Irrigation During a Crop Season,
W73-12464 3F

KALMAN, P. J.
Externalities, Welfare, And the Feasibility of Corrective Taxes,
W73-12694 6B

KALYUZHNYY, I. L.
Investigation of Thermal Properties of Soils in the Don River Basin for Estimation of Snowmelt Losses to Infiltration Into Frozen Soil (Issledovaniye teplovykh svoystv pochv basseyna r. Dona dlya otsenki poter' talykh vod na in fil'tratsiyu v merzluyu pochvu),
W73-12436 2G

KANWAL, S. S.
Effects of Various Soil Moisture Regimes and Different Levels of Nitrogen and Different Spacings of the Quality of Potato Tubers (Solanum Tuberosum L.),
W73-12640 3F

KAO, I. C.
ATP Pools in Pure and Mixed Cultures,
W73-12887 5A

KAPOTOV, A. A.
Laboratory Investigations of the Transmission Capacity of Frozen and Thawed Soils Based on Data of the Valday Field Laboratory (Vnigl) (Laboratornyye issledovaniya vodopropusknoy sposobnosti merzlykh i talykh pochvo-gruntov (po materialam merzlothoy laboratorii VNIGL)),
W73-12437 2G

KAPOTOVA, N. I.
Estimation and Forecast of Water Losses During a Spring Flood to Groundwater Recharge for Watersheds in Northwestern European USSR Based on Data of the Valday Field Laboratory (Otsenka i prognoz poter' vody v period vesenne go polovod'ya na popolneniye zapasov gruntovykh vod dlya vodosborov Severo-Zapada YeTS (po materialam VNIGL)),
W73-12439 2F

KAPPEN, L.
Extreme Water Stress and Photosynthetic Activity of the Desert Plant Artemisia Herba-Alba Asso,
W73-12785 2I

KARR, F. A.
Wastewater Treatment System,
W73-12455 5D

KATARKI, B. H.
Consumptive Use of Water by Cotton Grown in Transition Tract of Dharwar Under Rainfed Conditions,
W73-12988 3F

KATZ, A.
Trace Element Trapping in Pteropod Tests,
W73-12937 5B

KAUFMANN, M. R.
Diurnal and Seasonal Effects of Environment on Plant Water Relations and Fruit Diameter of Citrus,
W73-12805 3F

Evaluation of Tensiometers for Estimating Plant Water Stress in Citrus,
W73-12985 3F

KEELEY, J. W.
Disposal of Dredge Spoil; Problem Identification and Assessment and Research Program Development,
W73-12573 4A

Ground Water Pollution in the South Central States,
W73-12515 5B

Problems of Groundwater Pollution by Brine,
W73-12770 5B

KEENEY, D. R.
Gas Production in Sediments of Lake Mendota, Wisconsin,
W73-12378 5C

Nitrification in Sediments of Selected Wisconsin Lakes,
W73-12763 5C

The Nitrogen Cycle in Sediment-Water Systems,
W73-12843 5C

KELLER, R. T.
Recondition and Reuse of Organically Contaminated Waste Sodium Chloride Brines,
W73-12521 5D

KELLY, M. G.
Phytoplankton Algae: Nutrient Concentrations and Growth,
W73-12924 5C

KELSO, J. R. M.
Conversion, Maintenance and Assimilation for Walleye, Stizostedion Vitreum Vitreum, as Affected by Size, Diet and Temperature
W73-12832 8I

KENNEDY, D. J. L.
High Strength Bolted Galvanized Joints,
W73-12489 8G

KENNEDY, F. S.
The Role of Heavy Metals in Biology,
W73-12613 5C

KENNEDY, W. A.
Preliminary Study of Sablefish Culture, A Potential New Industry,
W73-12373 8I

KENT, D. C.
An Approach to Hydrogeologic Investigations of River Alluvium by the Use of Computerized Data Processing Techniques,
W73-12942 2A

KERR, P. C.
Carbon Cycle in Sediment-Water Systems,
W73-12846 5C

KERSTING, K.
A Nitrogen Correction for Caloric Values,
W73-12383 5A

KEULEGAN, G. H.
Reflection Characteristics of Screen Wave Absorbers; Hydraulic Model Investigation,
W73-12561 8B

Wave Damping Effects of Fibrous Screens; Hydraulic Model Investigation,
W73-12564 8B

Wave Transmission Through Rock Structures; Hydraulic Model Investigation,
W73-12563 8B

KHANNA, S. S.
Influence of Different Moisture Regimes and Methods of Phosphate Application on Growth and Nutrient Absorption by Wheat (Triticum Aestivum L.),
W73-12539 3F

KIKNADZE, T. Z.
Karst of the Arabika Massif (Karst massiva Arabika),
W73-12742 2K

KILGEN, R. H.
Mariculture in Estuarine Oil-Pipeline Canals in Louisiana,
W73-12951 5C

Standing Crops of Natural Fish Populations in Brackish-Water Oil Field Pipeline Canals,
W73-12952 5C

KING, D.
Land Disposal of Liquid Sewage Sludge: I. The Effect on Yield, in Vivo Digestibility, and Chemical Composition of Coastal Bermudagrass (Cynodon dactylon L. Pers.),
W73-12914 5D

KING, R. A.
Corrosion by the Sulphate-Reducing Bacteria,
W73-12756 5G

KJARAN, S. P.
Ground Water Models With Parallel Linear Reservoirs,
W73-12723 2F

KLEBER, E. V.
Water Decolorization,
W73-12446 5D

KLEINERT, S. J.
Mercury Levels in Wisconsin Fish and Wildlife,
W73-12812 5A

KNIGHT, D. W.
Long Wave Propagation in Idealized Estuary,
W73-12417 2L

KNOWLES, D. B.
Elements of the Water Resources Situation in Alabama,
W73-12749 6B

KO, H-Y,
Bearing Capacity of Footings in Plane Strain,
W73-12484 8D

KOIDE, M.
Lead Pollution: Records in Southern California Coastal Sediments,
W73-12589 5B

KOL, E.
Green Snow and Ice From the Antarctica,
W73-12644 2I

KOMAR, P. D.
Computer Models of Delta Growth Due to Sediment Input From Rivers and Longshore Transport,
W73-12592 2J

KONDRAT'YEV, V. I.
Characteristics of Water Migration in a Thick Leached Chernozem (Osobennosti dvizheniya vody v vyshchelochennom moshchnom chernozeme),
W73-12743 2G

KONRAD, J. G.
Gas Production in Sediments of Lake Mendota, Wisconsin,
W73-12378 5C

Nitrification in Sediments of Selected Wisconsin Lakes,
W73-12763 5C

KORKISCH, J.
Determination of Uranium in Urine Specimens Following Their Separation Through Anion Exchange, (Bestimmung Des Urans in Urinproben Nach Dessen Abtrennung Durch Anionenaustausch),
W73-12931 5A

KOROL'KOV, B. D.
Optimum Conditions for the Discharge of Paper Industry Effluents (Optimal'noe vodootvedenie stokov bumazhnogo proizvodstva),
W73-12547 5G

KORONEOS, E.
Stress Distribution Around a Tunnel Situated in a Layer Under the Action of Gravity,
W73-12490 8E

KOSOWSKI, Z. V.
Control of Mine Drainage from Coal Mine Mineral Wastes - Phase II - Pollution Abatement and Monitoring,
W73-12516 5G

KRAEMER, D.
Mariculture in Estuarine Oil-Pipeline Canals in Louisiana,
W73-12951 5C

Standing Crops of Natural Fish Populations in Brackish-Water Oil Field Pipeline Canals,
W73-12952 5C

KRAUS, K. A.
Cross-Flow Filtration Process for Removal of Total Organic Carbon and Phosphates from Aqueous Sewage Effluents,
W73-12460 5D

KREKKE, T. L.
Evaluation of Hydraulic Properties of Rock Masses Influenced by Major Heterogeneities,
W73-12468 8E

KRENKEL, P. A.
Total Mercury Analysis: Review and Critique,
W73-12885 5A

KRESTOVSKIY, O. I.
Evaporation During a Flood Period Caused by Spring Snowmelt (Ispareniye v period vesennego snegotayaniya i polovod'ya),
W73-12442 2D

Principles for Estimating and Forecasting Water Losses in Spring on Watersheds in Northwestern European USSR (Printsipy otsenki i prognoza poter' vesennikh vod na vodosborakh Severo-Zapada YeTS),
W73-12438 2G

KRITSKY, D. C.
Studies on Helminths of North Dakota: IV. Parasites of the River Carpsucker, Carpiodes carpio, with Descriptions of Three New Species (Monogenea),
W73-12984 2I

KUEPER, T. V.
Factors Influencing Detection of Salmonellae in Rendered Animal By-Products,
W73-12619 5A

KULKARNI, G. K.
Consumptive Use of Water by Cotton Grown in Transition Tract of Dharwar Under Rainfed Conditions,
W73-12988 3F

KUMKE, G.
Activated Sludge Treatment with Oxygen,
W73-12586 5D

KUPFER, R. L.
Process-Form Variability of Multiclass Coasts: Baja California,
W73-12422 2L

KUTTY, M. N.
Swimming Performance of Young Atlantic Salmon (Salmo salar) as Affected by Reduced Ambient Oxygen Concentration,
W73-12897 5C

KYLE, T. G.
Water Content in Convective Storm Clouds,
W73-12536 2B

LAAK, R.
Factors Affecting the Percolation Test,
W73-12716 5B

LACKEY, R. T.
Artificial Reservoir Destratification Effects on Phytoplankton,
W73-12895 5C

LAFEVERS, C. J.
Ground Water Pollution in the South Central States,
W73-12515 5B

LAL, J.
Rational Design of Well Screens,
W73-12771 8B

LAMKE, R. D.
Stage-Discharge Relations on Big Lost River Within National Reactor Testing Station, Idaho,
W73-12750 4A

LANDRY, B. M.
Economic and Related Impacts of Rural Water Systems in Mississippi,
W73-12493 6B

LANGDON, W. M.
Lithium Silicate Sedimentation Tracer for Shoal Deposit Studies,
W73-12862 5B

LANGE, O. L.
Extreme Water Stress and Photosynthetic Activity of the Desert Plant Artemisia Herba-Alba Asso,
W73-12785 2I

LANNING, J. A.
Voltammetric Study of the Hydrogen Ion/Hydrogen Couple in Acetonitrile/Water Mixtures,
W73-12872 2K

LARSON, D. P.
The Shagawa Lake Project: Lake Restoration by Nutrient Removal from Wastewater Effluent,
W73-12520 5D

LARSSON, A.
Metabolic Effects of PCB (Polychlorinated Biphenyls) on the Brown Trout (Salmo trutta),
W73-12819 5C

LATHAM, D. R.
Polyaromatic Hydrocarbons in High-Boiling Petroleum Distillates. Isolation by Gel Permeation Chromatography and Identification by Fluorescence Spectrometry,
W73-12875 5A

LAU, L. S.
Tritium Measurement of Natural Waters on Oahu, Hawaii: A Preliminary Interpretation (Sampling Period: July 1969 to June 1970),
W73-12499 5A

LAUDON, J. S.
The Sediments and History of Lake Butte des Morts, Wisconsin,
W73-12355 2J

LAUGHLIN, C. P.
Hydrologic Records for Lake County, Florida: 1971-72,
W73-12949 2E

LAVIN, P. M.
New Applications of Geophysical Methods to Ground-Water Problems in Pennsylvania,
W73-12783 2F

LAVKULICH, L. M.
Application of Acrylic Plastic Tension Lysimeters to Sloping Land,
W73-12638 2G

LAW, F. E.
Effect of School Water Fluoridation on Dental Caries: Final Results in Elk Lake, Pa., After 12 years,
W73-12647 5C

LAWRENCE, T.
Mayak, Russian Wild Ryegrass,
W73-12974 4A

LAX, A.
Determination of Exchangeable Cations in Calcareous Soils,
W73-12786 2G

LEAN, D.
The Characterization of Soluble Phosphorus Released by Limnetic Zooplankton,
W73-12904 5B

LEARY, A. G.
Regional Sewer System, Planning and Cost Estimation Model,
W73-12357 5G

LECH, J. J.
Preparation and Properties of 3-Trifluoromethyl-4-Aminophenol,
W73-12622 5B

LEE, C. H.
The Computation of Tides and Currents in Estuaries and Canals,
W73-12428 2L

LEE, G. F.
Nitrogen Release from Lake Sediments,
W73-12860 5B

LEE, J. W. JR
Tertiary Treatment of Combined Domestic and Industrial Wastes,
W73-12512 5D

LEGGETT, W. C.
Water Temperature and the Migrations of American Shad,
W73-12666 2I

LEHMKUHL, D. M.
Microdistribution and Density as Factors Affecting the Downstream Drift of Mayflies,
W73-12888 2I

LEIBY, P. D.
Studies on Helminths of North Dakota: IV. Parasites of the River Carpsucker, Carpiodes carpio, with Descriptions of Three New Species (Monogenea),
W73-12984 2I

LEITH, H.
Investigation of Mineral Nutrient Cycling in Upland Piedmont Forest,
W73-12700 4A

LEKANDER, K-E.
Environmental Care at Pulp Mills, Results and Expectations,
W73-12545 5D

LELONKIEWICZ, K.
The TTC Test for the Control of Effluent Purification (Test TTC - Narzedziem kontroli procesu oczyszczania),
W73-12535 5D

LENON, H.
Insecticide Residues in Water and Sediment from Cisterns on the U.S. and British Virgin Islands - 1970,
W73-12894 5B

LEONOV, YE. A.
Results of a Study of Water Regime of Soils on Small Watersheds in the Don River Basin (Rezul'taty izucheniya vodnogo rezhima pochv malykh vodosborov v basseyne r. Dona),
W73-12441 2G

Some Hydrophysical Characteristics of Soils in the Don River Basin to Kazanskaya Station (Nekotoryye vodno-fizicheskiye kharakteristiki pochv basseyna r. Dona do st-tsy Kazanskoy),
W73-12443 2G

LEONOVA, N. YE.,
Results of a Study of Water Regime of Soils on Small Watersheds in the Don River Basin (Rezul'taty izucheniya vodnogo rezhima pochv malykh vodosborov v basseyne r. Dona),
W73-12441 2G

Some Hydrophysical Characteristics of Soils in the Don River Basin to Kazanskaya Station (Nekotoryye vodno-fizicheskiye kharakteristiki pochv basseyna r. Dona do st-tsy Kazanskoy),
W73-12443 2G

LEOPOLD, L. B.
River Channel Change With Time: An Example,
W73-12590 2J

LEPPLE, F. K.
Trace Metal Baseline Studies on the Murderkill and St Jones Rivers, Delaware Coastal Plain,
W73-12959 5B

LERNER, M.
Impact of Water Fluoridation on Dental Practice and Dental Manpower,
W73-12816 5F

LESZCZYNSKI, C.
Practical Decolorization of Kraft Mill Effluents (Praktyka usuwania barwy sciekow posiarczanowych),
W73-12544 5D

LETEY, J.
Water Vapor Adsorption by Water-Repellent Soils at Equilibrium,
W73-12968 2G

LEUTHEUSSER, H. J.
Extreme Roughness of Natural River Channel,
W73-12416 8B

LEWANDER, K.
Metabolic Effects of PCB (Polychlorinated Biphenyls) on the Brown Trout (Salmo trutta),
W73-12819 5C

LEWIN, J.
A Note on Stream Ordering,
W73-12735 4A

LEWIS, A. G.
The Reduction of Copper Toxicity in a Marine Copepod by Sediment Extract,
W73-12909 5C

LIGGETT, J. A.
Finite Element Shallow Lake Circulation Analysis,
W73-12413 2H

LINDER, R. L.
Effects of Stress on Pheasants Previously Given Polychlorinated Biphenyls,
W73-12995 5C

LINDNER, C. P.
Chena River Lakes Project, Alaska, Problems Relating to Channel Development, Erosion, and Bank and Levee Protection,
W73-12559 8B

LING, J. T.
Encourage Applied Research and Publish the Findings,
W73-12758 5G

LIST, R.
Dynamics of a Falling Particle Zone,
W73-12603 2B

On The Number Distribution of Hail Growing in Updrafts,
W73-12602 2B

LIUZZO, G.
Heat-Exchanger for Desalting Sea Water,
W73-12453 3A

LIVESAY, B. J.
Diamond-Bit Research Provides Basic Drilling Parameters,
W73-12764 8B

LO CASCIO, M.
Evaluation of the Economic Effects of Anti-Pollution Public Policy,
W73-12684 6B

LOBKO, V. V.
An Efficient Method of Dewatering Effluent Sediments (Effektivnyi Sposob Obezvozhivaniya Osadkov Stochnikh Vod),
W73-12674 5E

LOFFLER, E.
High-Altitude Forests and Grasslands of Mt. Albert Edward, New Guinea,
W73-12824 4A

LOMBARDO, P. S.
Critical Review of Currently Available Water Quality Models,
W73-12352 6A

LORD, N. W.
Simulations of Meteorological Variations Over Arctic Coastal Tundra Under Various Physical Interface Conditions,
W73-12983 2B

LORENZ, O. A.
Soil Nitrogen Balance in Selected Row-Crop Sites in Southern California,
W73-12670 3F

LORIUS, C.
Tritium and Deuterium Content of the Snow in Groenland,
W73-12418 5B

LOUCKS, D. P.
Annual Literature Review: Administration, Systems Analysis,
W73-12840 5G

LOWE, R.
Biology of Rock Crab (Cancer Irroratus) in Northumberland Strait,
W73-12390 2L

LOWE, R. L.
Diatom Population Dynamics in a Central Iowa Drainage Ditch,
W73-12665 5C

LUCE, WILLIAM A.
Sediment-Water Nutrient Interchange in Eutrophic Lakes,
W73-12395 5C

LUE-KIM, H.
Hydrostatic Pressure in Relation to the Synchronous Culture of Algae in Open and Closed Systems,
W73-12798 5C

LYERLY, P. J.
Water Quality Hydrology of Lands Receiving Farm Animal Wastes,
W73-12353 5B

MACDONALD-BROWN, D. S.
The Mechanisms of Nitrogen Assimilation in Pseudomonads,
W73-12881 5C

MACMILLAN, A. L.
Process and Apparatus for Removing Mercury from Waste Water,
W73-12449 5D

MAHAFFREY, K. R.
Trisodium Nitrilotriacetate in Drinking Water: Metabolic and Renal Effects in Rats,
W73-12982 5C

MAHLMAN, H. A.
Cross-Flow Filtration Process for Removal of Total Organic Carbon and Phosphates from Aqueous Sewage Effluents,
W73-12460 5D

MAINI, Y. N. T.
Evaluation of Hydraulic Properties of Rock Masses Influenced by Major Heterogeneities,
W73-12468 8E

MAKAROV, O. B.
An Efficient Method of Dewatering Effluent Sediments (Effektivnyi Sposob Obezvozhivaniya Osadkov Stochnikh Vod),
W73-12674 5E

MAKSIMOV, V. F.
Optimum Conditions for the Discharge of Paper Industry Effluents (Optimal'noe vodootvedenie stokov bumazhnogo proizvodstva),
W73-12547 5G

MALANIFY, J. J.
Sensitivity and Detectability Limits for Elemental Analysis by Proton-Induced X-Ray Fluorescence with a 3 Mv Van de Graaff,
W73-12935 5A

MALIK, K. A.
Botany Along Sonamarg to Trunkhal,
W73-12657 2I

MALUEG, K. W.
The Shagawa Lake Project: Lake Restoration by Nutrient Removal from Wastewater Effluent,
W73-12520 5D

MANDT, M. G.
Waste Treatment System,
W73-12461 5D

MANNERS, J. G.
Bacteria of Muds Colonized by Spartina Townsendii and their Possible Role in Spartina Die-Back,
W73-12705 2L

MARCUSON, W. F. III
Time Effects on Dynamic Shear Modulus of Clays,
W73-12477 2G

MARSCHALL, K.
Process of Treating and Purifying Sewage, Particularly of Sewage Contaminated with Detergents,
W73-12458 5D

MARTIN, L.
Aeromonas-Induced Deaths Among Fish and Reptiles in an Eutrophic Inland Lake,
W73-12633 5C

MARTIN, P. E.
Antitranspirants for Conservation of Leaf Water Potential of Transplanted Citrus Trees,
W73-12993 2D

MATHIESON, A. C.
Ecological Studies of Codium fragile in New England, USA,
W73-12918 5C

MAXWELL, L. C.
Note on Charges and Bribes in the Long Run within Watersheds,
W73-12702 5G

MAY, E. B.
The Effect of Floodwater on Oysters in Mobile Bay,
W73-12658 5C

MCCOLL, R. H. S.
Chemistry and Trophic Status of Seven New Zealand Lakes,
W73-12928 5C

MCGARRY, M. G.
Reuse of Human Wastes in Agriculture,
W73-12817 5D

MCGRIFF, E. C. JR
Wastewater Treatment Design Related to Biological Growth Supported by Activated Carbon,
W73-12494 5D

MCINTYRE, J. D.
Effects of Metals on Fertilization and Development in Fish,
W73-12612 5C

MCKAY, J. F.
Polyaromatic Hydrocarbons in High-Boiling Petroleum Distillates. Isolation by Gel Permeation Chromatography and Identification by Fluorescence Spectrometry,
W73-12875 5A

MCKEE, J. W.
The Sediments and History of Lake Butte des Morts, Wisconsin,
W73-12355 2J

MCKONE, C. E.
The Effect of Adsorbents on the Rate of Degradation of Herbicides Incubated with Soil,
W73-12656 5B

MCLARNEY, W. O.
Aqualculutre: The Farming and Husbandry of Freshwater and Marine Organisms,
W73-12830 3F

MCLEAN, H. A.
Start-up of Biological Treatment Facilities for Pulp and Paper Mill Wastes,
W73-12531 5D

MCMAHON, J. W.
Membrane Filter Retention--A Source of Error in the C-14 Method of Measuring Primary Production,
W73-12908 5A

MCMAHON, T. A.
Reservoir-Yield Estimation Procedures,
W73-12478 4A

MCNAUGHTON, K. G.
Average Bowen-Ratio Methods of Calculating Evaportranspiration Applied to a Douglas Fir Forest,
W73-12801 2D

MCPARTLAND, E. J.
Measuring and Developing Methods of Attitude and Motivational Change in Implementing the Big Blue River Basin Water Plan,
W73-12491 6B

MEHTA, S. M.
Study of Utilization and Disposal of Lime Sludges Containing Phosphates,
W73-12501 5D

MELLOTT, J. C.
Physical Characteristics of Basalt Aquifers,
W73-12523 4B

MELSHEIMER, E. S.
Spillway for Oakley Dam, Sangamon River, Illinois-Appendix A: Type 2 (Revised) Spillway,
W73-12582 8A

MENGE, H.
Treatment of Soybean Oil Soapstock to Reduce Pollution,
W73-12668 5D

MERGARD, E. G.
Biological Aspects of Lead: An Annotated Bibliography - Literature From 1950 through 1964. Parts I and II,
W73-12627 5C

MERKEL, K. H.
New Applications of Geophysical Methods to Ground-Water Problems in Pennsylvania,
W73-12783 2F

MERLIVAT, L.
Tritium and Deuterium Content of the Snow in Groenland,
W73-12418 5B

MERRITT, C. JR
Application of Liquid Chromatography to Pollution Abatement Studies of Munition Wastes,
W73-12877 5A

MEYER, L. D.
Stone and Woodchip Mulches for Erosion Control on Construction Sites,
W73-12463 4D

MEYER, R. E.
Auger Soil Sampler for Herbicide Residues,
W73-12794 2G

MIKOLAJ, P. G.
Investigation of the Nature, Extent and Fate of Natural Oil Seepage Off Southern California,
W73-12958 5B

MILES, D. L.
Improvements in Moving Sprinkler Irrigation Systems for Conservation of Water,
W73-12507 3F

MILLER, A.
Insecticide Residues in Water and Sediment from Cisterns on the U.S. and British Virgin Islands - 1970,
W73-12894 5B

MILLER, H. H.
Degradation of Methylmercury by Bacteria Isolated from Environmental Samples,
W73-12620 5A

MILLER, J. D. A.
Corrosion by the Sulphate-Reducing Bacteria,
W73-12756 5G

MITCHELL, R.
Parasitism of Mosquitoes by Water Mites,
W73-12987 2I

MIYAMOTO, S.
High-Purity Distilled Water Producing Apparatus,
W73-12450 3A

Water Vapor Adsorption by Water-Repellent Soils at Equilibrium,
W73-12968 2G

MONETTE, L. J.
Stabilization of Sewage Solids by the Channel Aeration Process,
W73-12502 5D

MONK, J. T. JR
Stream-Velocity Effects on the Heavy-Metal Concentrations,
W73-12870 5B

MONKS, J. G.
Water Resource Decison Making--How Effective is the Public Input,
W73-12693 6B

MONTGOMERY, R. L.
Disposal of Dredge Spoil; Problem Identification and Assessment and Research Program Development,
W73-12573 4A

MONZIE, D.
The Problem of Color Measurement for Pulp Manufacturing Effluents (Le probleme de la mesure de couleur des effluents de fabrication des pates),
W73-12526 5G

MOORE, C. H.
Black Phytokarst From Hell, Cayman Islands, British West Indies,
W73-12593 2J

MOORE, C. R.
Demostration of a Waste Disposal System for Livestock Waste,
W73-12517 5D

MOORE, G. K.
Hydraulics of Sheetlike Solution Cavities,
W73-12944 4B

MOPPER, K.
Aspects of the Biogeochemistry of Carbohydrates and Proteins in Aquatic Environments,
W73-12371 5C

MORGAN, E. L.
Mortality Curves of Bluegills (Lepomis Macrochirus Rafinesque) Simultaneously Exposed to Temperature and Zinc Stress,
W73-12637 5C

MORGAN, P. R.
The Lake Chilwa Tilapia and Its Fishery,
W73-12642 2H

MORGAN, R. P. C.
Some Examples of Drainage Component Analysis,
W73-12734 4A

MORRIS, A. R.
Process and Apparatus for Removing Mercury from Waste Water,
W73-12449 5D

MORRIS, H. D.
Land Disposal of Liquid Sewage Sludge: I. The Effect on Yield, in Vivo Digestibility, and Chemical Composition of Coastal Bermudagrass (Cynodon dactylon L. Pers.),
W73-12914 5D

MOYER, J. R.
The Effect of Adsorbents on the Rate of Degradation of Herbicides Incubated with Soil,
W73-12656 5B

MUELLER, H. F.
Disinfection of Sewage Effluents,
W73-12504 5D

MUELLER, J. C.
Microbiological Treatment Parameters of Bleached Kraft Pulp Mill Effluents,
W73-12551 5D

MUELLER, R. T.
Sodium Relations in Desert Plants: 2. Distribution of Cations in Plant Parts of Three Different Species of Atriplex,
W73-12793 2I

MUIR, J.
Nutrients in Nebraska's Waters,
W73-12615 5B

MUIR, T. C.
Hydrological Reservoir Design Using Basic Systems Theory Techniques,
W73-12471 8A

MURAI, T.
Rearing Channel Catfish Fingerlings Under Intensive Culture Conditions,
W73-12488 8I

MURARO, G.
Anti-Pollution Policy and Cost Allocation: The Issues in Practice,
W73-12677 6B

MURPHY, K. L.
Start-up of Biological Treatment Facilities for Pulp and Paper Mill Wastes,
W73-12531 5D

MUSTAFEE, T. P.
Effect of Soil Moisture on the Growth of Macrophomina Phaseoli, Sclerotium Rolfsii and Fausarium Solani in Soil,
W73-12831 3F

MUTH, GERALD L.
PCBs and DDT,
W73-12402 5C

NADEAU, R. J.
Biological Effects of Oil Pollution - Selected Bibliography II,
W73-12626 5C

NAKAMURA, H.
Ecological Information on the Differences in the Number of Culex tritaeniorhynchus Larvae Among Paddy Fields (In Japanese),
W73-12829 3F

NAKANISHI, M.
A Comparison of Liquid Scintillation and Geiger-Muller Estimates of Primary Productivity in an in Situ Experiment,
W73-12848 5A

NANEY, J. W.
An Approach to Hydrogeologic Investigations of River Alluvium by the Use of Computerized Data Processing Techniques,
W73-12942 2A

NARANG, R. S.
Effects of Various Soil Moisture Regimes and Different Levels of Nitrogen and Different Spacings of the Quality of Potato Tubers (Solanum Tuberosum L.),
W73-12640 3F

NAVROT, J.
The Effect of Soil Temperature on Plants Grown in Saline Soil,
W73-12797 2G

NCNEARY, S. S.
Water Levels Near a Well Discharging From an Unconfined Aquifer,
W73-12777 4B

NEBBIA, G.
Economic Effects of Technology Changes in Relation to the Environment,
W73-12685 6B

NEDVED, T. K.
Lithium Silicate Sedimentation Tracer for Shoal Deposit Studies,
W73-12862 5B

NEFF, D. J.
Responses od Deer and Elk to Beaver Creek Watershed Treatments,
W73-12405 4D

NEJEDLY, A.
The Effect of Longitudinal Dispersion on the Deoxygenation Rate in Polluted Streams,
W73-12714 5B

NELSON, AUSTIN W.
Mathematical modeling of Phytoplankton Populations,
W73-12399 5C

NESTLE, A. C.
Corrosion Monitoring Method Reduces Effect of Variables in Analyzing Oil Field Waters,
W73-12767 8G

NEWMAN, J. E.
Annual Water Balance and Agricultural Development in Alaska,
W73-12664 3F

NIKIFOROV, M. M.
Selection of a Suitable System of Effluent Purification (O vybore ratsional'noi sistemy ochistki stochnykh vod),
W73-12673 5D

NILES, C. F. JR
Phosphorus Removal and Plant Operation Studies at Fort Wayne, Indiana,
W73-12500 5D

NIMMO, D. R.
A Cage for Exposing Aquatic Animals to Bottom Sediments,
W73-12372 2L

NOBLE, D.
Steam Distillation: A Simple Technique for Recovery of Petroleum Hydrocarbons from Tainted Fish,
W73-12849 5A

NOGAJ, R. J.
Selecting Waste Water Aeration Equipment,
W73-12534 5D

NOVAK, J. T.
Characterization of Chemical Sludges,
W73-12871 5A

NUTTER, L. J.
Hydrogeology of the Carbonate Rocks, Frederick and Hagerstown Valleys, Maryland,
W73-12719 4B

OAKES, A. J.
Resistance in Digitaria to Yellow Sugarcane Aphid, Siphaflava (Forbes) as Related to Temperature and Rainfall,
W73-12643 2I

O'BRIEN, W. J.
Phytoplankton Algae: Nutrient Concentrations and Growth,
W73-12924 5C

O'CONNELL, P. F.
Valuation of Timber, Forage and Water from National Forest Lands,
W73-12701 6B

OKEDI, J.
The Food and Feeding Habits of the Small Mormyrid Fishes of Lake Victoria, East Africa,
W73-12641 2H

OLMSTED, F. H.
Sources of Data for Evaluation of Selected Geothermal Areas in Northern and Central Nevada,
W73-12947 4B

OLSON, E.
Public Support of Private Water Resource Development in Agriculture--With Implications for Firm Growth,
W73-12698 4B

OLSON, G. F.
Some Short-Term Indicators of Sublethal Effects of Copper on Brook Trout, Salvelinus Fontinalis,
W73-12859 5C

OLSON, R. A.
Nutrients in Nebraska's Waters,
W73-12615 5B

OPFERKUCH, R. E.
Study of Utilization and Disposal of Lime Sludges Containing Phosphates,
W73-12501 5D

OPSCHOOR, H.
Some Limitations of Benefit-Cost Analysis in Respect of Programmes with Environmental Consequences,
W73-12682 6B

ORBACH, H.
Viruses in Metropolitan Waters: Concentration by Polyelectrolytes, Freeze Concentration, and Ultrafiltration,
W73-12867 5F

ORCUTT, J. C.
Fluidized Bed Clarification as Applied to Wastewater Treatment,
W73-12505 5D

OSBORN, J.
Water Vapor Adsorption by Water-Repellent Soils at Equilibrium,
W73-12968 2G

OSWALT, N.R.
Outlet Works Stilling Basin for Tallahala Dam, Tallahala Creek, Mississippi; Hydraulic Model Investigation,
W73-12568 8B

PAIJMANS, K.
High-Altitude Forests and Grasslands of Mt. Albert Edward, New Guinea,
W73-12824 4A

PALMER, M. D.
Lake Movements with Partial Ice Cover,
W73-12663 2H

Measurement of Currents in the Great Lakes,
W73-12741 2H

PANDOLFO, J. P.
Simulations of Meteorological Variations Over Arctic Coastal Tundra Under Various Physical Interface Conditions,
W73-12983 2B

PANICHI, C.
Environmental Isotopes and Circulation in Aquifers Under Venice (Isotopes du Milieu et Circulations dans les Aquiferes du Sous-Sol Venitien),
W73-12419 2F

PANNETT, D. J.
Climatic Change and Arrested Meander Development on the River Severn,
W73-12737 4A

PARES, R. D.
Viruses Infecting Peaches in the Murrumbidgee Irrigation Areas of New South Wales,
W73-12981 3F

PARIS, D. F.
Carbon Cycle in Sediment-Water Systems,
W73-12846 5C

PARKER, R. R.
A Record of Pacific Herring (Clupea harengus Pallasi) Feeding on Juvenile Chinook Salmon (Oncorhynchus tshawytscha) in a British Columbia Estuary,
W73-12375 2L

PARLANGE, J-Y.
Theory of Water Movement in Soils: 10. Cavities with Constant Flux,
W73-12600 2G

PARSHIKOV, V. V.
Hydrophysical Properties and Water Regime of Crimean Southern Chernozems in a Field Crop Rotation (Vodno-fizicheskiye svoystva i vodnyy rezhim yuzhnykh chernozemov Kryma v polevom sevooborote),
W73-12744 2G

PARSONS, T. R.
Simulation Study of Phytoplankton Photosynthesis and Growth in the Fraser River Estuary,
W73-12919 5C

PATALAS, K.
Crustacean Plankton and the Eutrophication of Lakes in the Okanagan Valley, British Columbia,
W73-12624 5C

PATIL, T. P.
Variability of Rainfall and Agricultural Efficiency of Sholapur District,
W73-12659 3F

PATON, D. M.
Frost Resistance in Eucalyptus: A New Method for Assessment of Frost Injury in Altitudinal Provenances of E. Viminalis,
W73-12815 2I

PATRICK, W. H. JR
Nitrogen Loss from Flooded Soil,
W73-12967 2G

PATRIDGE, D. L.
Selected Data on Wells in the Barstow Area, Mojave River Basin, California,
W73-12421 4B

PATULSKI, D.
Insecticide Residues in Water and Sediment from Cisterns on the U.S. and British Virgin Islands - 1970,
W73-12894 5B

PAUL, B. W.
Heuristic Ranking and Prioritizing Under Subjective Conductions,
W73-12470 6B

PAVLOVA, K. K.
Investigation of Thermal Properties of Soils in the Don River Basin for Estimation of Snowmelt Losses to Infiltration Into Frozen Soil (Issledovaniye teplovykh svoystv pochv basseyna r. Dona dlya otsenki poter' talykh vod na in fil'tratsiyu v merzluyu pochvu),
W73-12436 2G

PAWLOSKI, M. C.
Germination of Wheat as Affected by Soil Water Stress,
W73-12884 3F

PAYNE, R. W.
Waste Disposal Well Performance,
W73-12779 5E

PEARCE, D.
Some Limitations of Benefit-Cost Analysis in Respect of Programmes with Environmental Consequences,
W73-12682 6B

PEDEN, A. E.
Description and Ecology of Hyaiella Texana N. Sp. (Crustacea: Amphipoda) from the Edwards Plateau of Texas,
W73-12900 2I

PENROSE, L. J.
Viruses Infecting Peaches in the Murrumbidgee Irrigation Areas of New South Wales,
W73-12981 3F

PETERKA, J. J.
Benthic Invertebrates in Lake Ashtabula Reservoir, North Dakota,
W73-12863 5C

PETERS, R.
The Characterization of Soluble Phosphorus Released by Limnetic Zooplankton,
W73-12904 5B

PETERS, R. E.
Water Quality Hydrology of Lands Receiving Farm Animal Wastes,
W73-12353 5B

PETERSEN, R. C.
The Utilization of Leaf Litter by Stream Detritivores,
W73-12882 5C

PETERSON, J. H. JR
A Study of Selected Aspects of Rural Water System Development in Mississippi,
W73-12492 6B

PFEIFFER, G. H.
Public Support of Private Water Resource Development in Agriculture--With Implications for Firm Growth,
W73-12698 4B

PIERRE, C.
The Problem of Color Measurement for Pulp Manufacturing Effluents (Le probleme de la mesure de couleur des effluents de fabrication des pates),
W73-12526 5G

PILLAI, S. C.
Significance of Heating Agricultural Soils,
W73-12802 3F

PINAMONT, C. J.
Recondition and Reuse of Organically Contaminated Waste Sodium Chloride Brines,
W73-12521 5D

PINTER, T.
Thorium in Water and Algae from the Adriatic Sea,
W73-12927 5A

PITKO, J.
Climatology of Rainfall Probabilities for Oahu, Hawaii,
W73-12587 2B

PITTS, G.
Aqueous Iron-Sulfur Systems in Rice Field Soils of Louisiana,
W73-12385 3F

PITTS, J. W.
Galvanic Corrosion of Metals in Cementing Materials,
W73-12775 8G

PITTY, A. F.
Observations of Tufa Deposition,
W73-12730 2K

PLOTNIKOVA, G. N.
Silica In Thermal and Cold Waters (Kremnezem v termal'nykh i kholodnykh vodakh),
W73-12751 2K

POKORNY, S.
Determination of Organic Substances in Industrial Effluents (Nektere moznosti stanoveni organickeho znecisteni odpadnich vod),
W73-12532 5A

POLIKANOV, YU. G.
Determination of Melamine-Formaldehyde Resin in White Waters (Opredelenie soderzhaniya melamino-formaldegidnoi smoly v podsetochnykh vodakh),
W73-12672 5A

POOLE, N. J.
Fungi Colonizing Wood Submerged in the Medway Estuary,
W73-12825 2L

PORCELLA, DONALD B.
Phosphorus and Eutrophication,
W73-12394 5C

Sediment-Water Nutrient Interchange in Eutrophic Lakes,
W73-12395 5C

PORE, N. A.
Forecasting Storm-Induced Beach Changes Along Virginia's Ocean Coast,
W73-12584 4A

POSNER, G. S.
A Hydrographic Atlas of Larger North Carolina Sounds,
W73-12948 2L

POSTNIKOV, A. N.
Evaporation During a Flood Period Caused by Spring Snowmelt (Ispareniye v period vesennego snegotayaniya i polovod'ya),
W73-12442 2D

POULOS, H. G.
Simplified Calculation of Embankment Deformations,
W73-12473 8D

PRASAD, J.
Evaluation of Herbicides for Submerged Weeds in Chambal and Bhakra-Nangal Canal Systems,
W73-12738 5G

PRATT, P. F.
Soil Nitrogen Balance in Selected Row-Crop Sites in Southern California,
W73-12670 3F

PRESSLEY, T. A.
Waste Water Purification by Breakpoint Chlorination and Carbon Adsorption,
W73-12459 5D

PRESTWOOD, A. K.
Aeromonas-Induced Deaths Among Fish and Reptiles in an Eutrophic Inland Lake,
W73-12633 5C

PRICE, P. C.
Fungi Colonizing Wood Submerged in the Medway Estuary,
W73-12825 2L

PRIMEAUX, W. J. JR
The Effect of Price and Other Selected Variables on Water Consumption,
W73-12495 6B

PROTO, D.
Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol 1 - Chemistry,
W73-12753 2H

PRYOR, L. D.
The Selection of Eucalpts for Regeneration,
W73-12980 2I

PUGH, P. R.
An Evaluation of Liquid Scintillation Counting Techniques for Use in Aquatic Primary Production Studies,
W73-12907 5A

PURKAYASTHA, R.
Simultaneous Detection of the Residues of Atrazine and Linuron in Water, Soil, Plant, and Animal Samples by Thin-layer Chromatography,
W73-12811 5A

PUROHIT, F. R.
Water Metabolism in Desert Sheep, Effects of Various Degrees of Water Restriction on the Distribution of Body Water in Mariwari Sheep,
W73-12788 3F

QUIGLEY, J. T.
Waste Water Treatment in Commercial Fish Processing: Reducing Stick Water Loadings,
W73-12420 5D

QURAISHI, M. S.
Edaphic and Water Relationships of Aldicarb and its Metabolites,
W73-12979 2G

RACK, E. P.
Optimum Procedure for the Determination of Selenium in Biological Specimens Using Se-77m Neutron Activation,
W73-12876 5A

RAINES, B. W.
Characterization of Sweet Potato Processing Wastes,
W73-12852 5A

RAMNARINE, A.
The Reduction of Copper Toxicity in a Marine Copepod by Sediment Extract,
W73-12909 5C

RANDOLPH, J. R.
Water Levels Near a Well Discharging From an Unconfined Aquifer,
W73-12777 4B

RANNEY, T. A.
Rapid Field Determination of Nitrate in Natural Waters,
W73-12810 2K

RAO, B. V. VENKATA
Soluble Silica and Fluoride in Some Surface and Ground Waters of Mysore State,
W73-12969 2K

RAO, T.
The Quality of Drainage Water from Irrigated Black Cotton Soils for Irrigation,
W73-12650 3F

RAVANKO, O.
The Physiognomy and Structure of the Benthic Macrophyte Communities on Rocky Shores in the Southwestern Archipelago of Finland (Seili Islands),
W73-12929 5A

RAVIKOVITCH, S.
The Effect of Soil Temperature on Plants Grown in Saline Soil,
W73-12797 2G

RAVOIRE, J.
Tritium and Deuterium Content of the Snow in Groenland,
W73-12418 5B

RAWSON, M. V.
The Seasonal Abundance of the Ancyrocephalinae (Monogenea) on Largemouth Bass in Walter F. George Reservoir,
W73-12978 2H

RAZZELL, W. E.
Pitfalls and Procedures in BOD Tests,
W73-12527 5A

RECHT, H. L.
Water Decolorization,
W73-12446 5D

REDDELL, D. L.
Water Quality Hydrology of Lands Receiving Farm Animal Wastes,
W73-12353 5B

REDFIELD, M. L.
Costs and Profitability in the Commercial Fishing Industry: The Insurance Dilemma,
W73-12699 6B

REED, J.
Viruses in Metropolitan Waters: Concentration by Polyelectrolytes, Freeze Concentration, and Ultrafiltration,
W73-12867 5F

REEDER, H. E.
Sediment Resulting From Construction of an Interstate Highway in the Piedmont Area of North Carolina,
W73-12713 4C

REID, G. W.
Systems Approach to Metropolitan and Regional Area Water and Sewer Planning,
W73-12351 6A

REIMERS, R. S.
Total Mercury Analysis: Review and Critique,
W73-12885 5A

REISEN, W. K.
The Influence of Organic Drift on the Food Habits and Life History of the Yellowfin Shiner, Notropis Lutipinnis (Jordan and Brayton),
W73-12844 2I

REITER, P.
Heat and Water Balance Studies on Grand Cayman,
W73-12822 2D

REMSON, I.
Water Levels Near a Well Discharging From an Unconfined Aquifer,
W73-12777 4B

RENOUF, R. N.
Waterfowl Utilization of Beaver Ponds in New Brunswick,
W73-12662 2I

RESIO, D.
Classification of the Coastal Environments of the World: Part II. Africa,
W73-12950 2L

REYNOLDS, H. G.
Wildlife Habitat Improvement in Relation to Watershed Management in the Southwest,
W73-12404 4D

RICHARDSON, B. Z.
Effects of Air Gaps and Saturated Voids on Accuracy of Neutron Moisture Measurements,
W73-12636 2G

RICHARDSON, J. M. JR
The Development of a Regional Systems Oriented Water Management Model: A Tool for Policy Analysis,
W73-12839 6A

RICHARDSON, R. W.
Quantitative Sampling of Live Zooplankton With a Filter-Pump System,
W73-12911 5A

RICHERSON, PETER J.
The Role of Zooplankton in the Process of Eutrophication,
W73-12397 5C

RIEMER, D. N.
Effects of Fertilization on Aquatic Plants, Water and Bottom Sediments,
W73-12661 5C

RILEY, T. E.
Auger Soil Sampler for Herbicide Residues,
W73-12794 2G

RING, G. J.
Simplified Calculation of Embankment Deformations,
W73-12473 8D

ROBB, D. C. N.
The Planning Viewpoint,
W73-12964 6B

ROBERTS, H. H.
Black Phytokarst From Hell, Cayman Islands, British West Indies,
W73-12593 2J

Process-Form Variability of Multiclass Coasts: Baja California,
W73-12422 2L

ROBERTS, M. C.
Horton's 1945 Study: A Cartobibliography,
W73-12596 7C

ROBINSON, G.
A Suggested New Approach to the Analysis of Drainage Basin Shapes,
W73-12729 4A

Trials on Trends Through Clusters of Cirques,
W73-12732 2J

ROBINSON, G. G. C.
A Relationship between Heterotrophic Utilization of Organic Acids and Bacterial Populations in West Blue Lake, Manitoba,
W73-12903 5C

RODGERS, E. B. JR
Sand Control - 3. Chemical Consolidation,
W73-12760 8G

ROGERS, WILMER A.
The Seasonal Abundance of the Ancyrocephalinae (Monogenea) on Largemouth Bass in Walter F. George Reservoir,
W73-12978 2H

ROHDE, F. G.
Hydrological Reservoir Design Using Basic Systems Theory Techniques,
W73-12471 8A

ROMANOV, V. V.
Investigation of Thermal Properties of Soils in the Don River Basin for Estimation of Snowmelt Losses to Infiltration Into Frozen Soil (Issledovaniye teplovykh svoystv pochv basseyna r. Dona dlya otsenki poter' talykh vod na in fil'tratsiyu v merzluyu pochvu),
W73-12436 2G

ROMMEL, S. A. JR
A Simple Method for Recording Fish Heart and Operculum Beats Without the Use of Implanted Electrodes,
W73-12858 7B

ROMNEY, E. M.
Sodium Relations in Desert Plants: 1. Cation Contents of Some Plant Species from the Mojave and Great Basin Deserts,
W73-12792 2I

Sodium Relations in Desert Plants: 2. Distribution of Cations in Plant Parts of Three Different Species of Atriplex,
W73-12793 2I

ROSE, J. M.
Degradation of Methylmercury by Bacteria Isolated from Environmental Samples,
W73-12620 5A

ROSENBAUM, M.
High Speed A-D Converters in a Memory Test System,
W73-12891 7C

ROSENFELD, A. S.
Methods for Pulp and Paper Mill Sludge Utilization and Disposal,
W73-12519 5E

ROSHORE, E. C.
Tests of Selected Insulating Materials for Mass Concrete,
W73-12431 8F

ROSS, P. J.
A Study of Selected Aspects of Rural Water System Development in Mississippi,
W73-12492 6B

ROTH, L.
Water Pollution in the Pulp and Paper Industry. I. General and In-Plant Modifications,
W73-12553 5D

Water Pollution in the Pulp and Paper Industry. II. Testing Methods,
W73-12554 5A

Water Pollution in the Pulp and Paper Industry. III. Stream Response,
W73-12555 5C

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. A. Physical Operations,
W73-12556 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. B. Biological Systems,
W73-12557 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. C. Chemical Processes, General Observations, and Reports,
W73-12558 5D

ROUSE, J. V.
Mineral Pollution in the Colorado River Basin,
W73-12715 5B

ROUSH, T. H.
Biological Effects of Oil Pollution - Selected Bibliography II,
W73-12626 5C

ROYER, L. M.
Uptake of Mercury by Caged Rainbow Trout (Salmo Gairdneri) in the South Saskatchewan River,
W73-12857 5C

RUBENSTEIN, S. H.
Viruses in Metropolitan Waters: Concentration by Polyelectrolytes, Freeze Concentration, and Ultrafiltration,
W73-12867 5F

RUNDKRIST, K. A.
Flotation Machine with Vertically Reciprocating Aerators,
W73-12452 5D

RUSH, F. E.
Sources of Data for Evaluation of Selected Geothermal Areas in Northern and Central Nevada,
W73-12947 4B

RYAN, J. B.
Effects of Fertilization on Aquatic Plants, Water and Bottom Sediments,
W73-12661 5C

RYTHER, J. H.
Aqualculutre: The Farming and Husbandry of Freshwater and Marine Organisms,
W73-12830 3F

SABLIK, J.
Possibilities of Water Treatment by Means of a Magnetic Field,
W73-12481 5D

SAINT-PE, M. A.
Evaluation of a Shallow Leaky Water Table Aquifer in a Subhumid Region of France,
W73-12941 2F

SALKI, A.
Crustacean Plankton and the Eutrophication of Lakes in the Okanagan Valley, British Columbia,
W73-12624 5C

SALZINGER, K.
Behavior of the Goldfish as an Early Warning System for the Presence of Pollutants in Water,
W73-12916 5A

SAMEOTO, D. D.
Annual Life Cycle and Production of the Chaetognath Sagitta elegans in Bedford Basin, Nova Scotia,
W73-12898 5B

SAND, W. R.
Water Content in Convective Storm Clouds,
W73-12536 2B

SANGER, J. E.
Stratigraphy of Fossil Pigments as a Guide to the Postglacial History of Kirchner Marsh, Minnesota,
W73-12386 5C

SANKS, R. L.
Ion Exchange Color and Mineral Removal from Kraft Bleach Wastes,
W73-12522 5D

SAUCIER, R. T.
Disposal of Dredge Spoil; Problem Identification and Assessment and Research Program Development,
W73-12573 4A

SAUNDERS, R. L.
Swimming Performance of Young Atlantic Salmon (Salmo salar) as Affected by Reduced Ambient Oxygen Concentration,
W73-12897 5C

SAVEY, P.
The Multipurpose Development of the River Rhone Valley,
W73-12467 4A

SAWYER, G. A.
New Trends in Waste Water Treatment and Recycle,
W73-12533 5D

SAXTON, S.
Spectrophotometric Determination of Ammonia,
W73-12886 5A

SCALF, M. R.
Ground Water Pollution in the South Central States,
W73-12515 5B

SCARRATT, D. J.
Biology of Rock Crab (Cancer Irroratus) in Northumberland Strait,
W73-12390 2L

SCHELSKE, C. L.
Nutrient Enrichment and Eutrophication of Lake Michigan,
W73-12377 5C

SCHILLINGER, G. R.
Mineral Pollution in the Colorado River Basin,
W73-12715 5B

SCHIMKE, G. R.
Water Pollution Potential of Manufactured Products--Catalog Section I,
W73-12671-1 5G

Water Pollution Potential of Manufactured Products--Catalog Section II, Product Listing,
W73-12671-2 5G

Water Pollution Potential of Manufactured Products--Catalog Section III, Chemical Ingredient Listing,
W73-12671-3 5G

SCHLUETER, R. S.
Investigation of the Nature, Extent and Fate of Natural Oil Seepage Off Southern California,
W73-12958 5B

SCHMALZ, KIRK L.
Sediment-Water Nutrient Interchange in Eutrophic Lakes,
W73-12395 5C

SCHNEIDER, R. F.
Preimpoundment Study of West Point Lake, Georgia,
W73-12376 5C

SCHNITKER, D.
History of Sedimentation in Montsweag Bay,
W73-12740 2L

SCHOL, M. C.
Hydrologic Records for Lake County, Florida: 1971-72,
W73-12949 2E

SCHRODER, L. J.
Radiochemical Monitoring of Water After the Cannikin Event, Amchitka Island, Alaska, October, 1972,
W73-12945 5B

SCHULTS, D. W.
The Shagawa Lake Project: Lake Restoration by Nutrient Removal from Wastewater Effluent,
W73-12520 5D

SCHULTZ, J. S.
Electrical Stimulation of Microbial Waste Treatment,
W73-12503 5D

SCHULZE, E-D.
Extreme Water Stress and Photosynthetic Activity of the Desert Plant Artemisia Herba-Alba Asso,
W73-12785 2I

SCOTT, V. H.
Simplified Solution for Decreasing Flow in Wells,
W73-12759 8B

SEIM, E. C.
Nutrients in Nebraska's Waters,
W73-12615 5B

SEITZ, R. C.
Observations of Intermediate and Small Scale Turbulent Water Motion in a Stratified Estuary (Parts I and II),
W73-12424 2L

SEMIKHNENKO, P. G.
Characteristics of Water Migration in a Thick Leached Chernozem (Osobennosti dvizheniya vody v vyshchelochennom moshchnom chernozeme),
W73-12743 2G

SERGEYEVA, A. G.
Evaporation During a Flood Period Caused by Spring Snowmelt (Ispareniye v period vesennego snegotayaniya i polovod'ya),
W73-12442 2D

SERVIZI, J. A.
Detoxification of Kraft Pulp Mill Effluent by an Aerated Lagoon,
W73-12529 5D

SHAFER, W. H. JR
Mineral Pollution in the Colorado River Basin,
W73-12715 5B

SHAPCHENKO, V. M.
An Efficient Method of Dewatering Effluent Sediments (Effektivnyi Sposob Obezvozhivaniya Osadkov Stochnikh Vod),
W73-12674 5E

SHARMA, R. B.
Effect of Compaction on Yield and Uptake of N, P and K by Maize (Zea mays L.),
W73-12660 3F

Influence of Different Moisture Regimes and Methods of Phosphate Application on Growth and Nutrient Absorption by Wheat (Triticum Aestivum L.),
W73-12539 3F

SHARMA, R. R.
Erodibility of Hill Soils of Sutlej Catchment Area in Himachal Pradesh,
W73-12635 2J

SHARP, H. B.
Some Effects of Evaporation Suppression on Reservoir Ecology,
W73-12869 5C

SHARP, J. C.
Evaluation of Hydraulic Properties of Rock Masses Influenced by Major Heterogeneities,
W73-12468 8E

SHARP, W. E.
A Topologically Optimum River Sampling Plan for South Carolina,
W73-12498 5B

SHAW, D. G.
Lipids in Shallow Bottom Sediments,
W73-12717 5B

SHAYKEWICH, C. F.
Germination of Wheat as Affected by Soil Water Stress,
W73-12884 3F

SHELTON, M. E.
Studies on Helminths of North Dakota: IV. Parasites of the River Carpsucker, Carpiodes carpio, with Descriptions of Three New Species (Monogenea),
W73-12984 2I

SHEPARD, F. P.
Sea Floor Off Magdalena Delta and Santa Marta Area, Colombia,
W73-12591 2J

SHEPPE, W.
The Annual Cycle of Small Mammal Populations on a Zambian Floodplain,
W73-12814 2I

SHIH, C. S.
Identification of Water Resources Planning Problems in the Metropolitan Area of Greater San Antonio and Its Associated Counties,
W73-12354 6B

SHIMIZU, T.
Salmonella Contamination of Rivers and Sewages in Fukuyama City, (In Japanese),
W73-12648 5C

SHINDE, J. E.

SHINDE, J. E.
Effect of Varying Water Management Practices on the Growth, Yield and Nitrogen Uptake by High-Yielding Rice Varieties,
W73-12583 3F

SHISHKIN, A. I.
Optimum Conditions for the Discharge of Paper Industry Effluents (Optimal'noe vodootvedenie stokov bumazhnogo proizvodstva),
W73-12547 5G

SHMIDT, L. I.
An Efficient Method of Dewatering Effluent Sediments (Effektivnyi Sposob Obezvozhivaniya Osadkov Stochnikh Vod),
W73-12674 5E

SHOTTS, E. B. JR
Aeromonas-Induced Deaths Among Fish and Reptiles in an Eutrophic Inland Lake,
W73-12633 5C

SHTREIS, G. B.
Determination of Melamine-Formaldehyde Resin in White Waters (Opredelenie soderzhaniya melamino-formaldegidnoi smoly v podsetochnykh vodakh),
W73-12672 5A

SHUBER, N.
Viruses in Metropolitan Waters: Concentration by Polyelectrolytes, Freeze Concentration, and Ultrafiltration,
W73-12867 5F

SIEBURTH, J. MCN.
Fouling on Eelgrass (Zostera Marina L.),
W73-12631 5G

SIERRA-BRACERO, A.
Resistance in Digitaria to Yellow Sugarcane Aphid, Siphaflava (Forbes) as Related to Temperature and Rainfall,
W73-12643 2I

SILVEY, J. K. G.
Some Effects of Evaporation Suppression on Reservoir Ecology,
W73-12869 5C

SINGH, C. N.
Concentration of Fluorine in Potable Water in Bihar Plateau: A Preliminary Survey,
W73-12645 5A

SINGH, G.
Botany Along Sonamarg to Trunkhal,
W73-12657 2I

SINGH, R. P.
Evaluation of Herbicides for Submerged Weeds in Chambal and Bhakra-Nangal Canal Systems,
W73-12738 5G

SINGH, R. S.
Effect of Quality of Well Waters on the Germination and Mineral Composition of Wheat on Saline-Sodic Soils Rich in Magnesium,
W73-12809 3C

SINGH, S.
Effect of Quality of Well Waters on the Germination and Mineral Composition of Wheat on Saline-Sodic Soils Rich in Magnesium,
W73-12809 3C

SINKER, C. A.
Climatic Change and Arrested Meander Development on the River Severn,
W73-12737 4A

SISSENWINE, N.
Extremes of Hydrometeors at Altitude for Mil-Std-210B: Supplement--Drop-Size Distributions,
W73-12599 2B

SIVANESAN, A.
Bacteria of Muds Colonized by Spartina Townsendii and their Possible Role in Spartina Die-Back,
W73-12705 2L

SKERFVING, S.
Mercury in Fish: Some Toxicological Considerations,
W73-12826 5C

SKOGERBOE, G. V.
Computing Backwater at Open Channel Constrictions,
W73-12415 8B

Coordination of Agricultural and Urban Water Quality Management in the Utah Lake Drainage Area,
W73-12508 5G

Evaluation of Urban Water Management Policies in the Denver Metropolitan Area,
W73-12510 5G

Generalized Discharge Relations for Cutthroat Flumes,
W73-12474 8B

Mathematical Modeling of Water Management Strategies in Urbanizing River Basins,
W73-12509 5G

SKRUNDE, A. A.
Flotation Machine with Vertically Reciprocating Aerators,
W73-12452 5D

SLETSJOE, A.
Vessel for the Removal of Oil on Water,
W73-12448 5G

SMALE, B. C.
Methods for Pulp and Paper Mill Sludge Utilization and Disposal,
W73-12519 5E

SMALL, E.
Water Relations of Plants in Raised Sphagnum Peat Bogs,
W73-12838 2I

SMETHERMAN, B. B.
Peruvian Fisheries: Conservation and Development.
W73-12689 6B

SMETHERMAN, R. M.
Peruvian Fisheries: Conservation and Development.
W73-12689 6B

SMITH, E. G.
Influence of Certain Rotations Upon Cotton Production in the San Joaquin Valley,
W73-12975 3F

SMITH, K. V. H.
Computer Determination of Critical Depth Control Points in Open Channel Flow,
W73-12483 8B

SMITH, R. C.
Optical Properties and Color of Lake Tahoe and Crater Lake,
W73-12926 5A

SMORODIN, G. S.
Hydrophysical Properties and Water Regime of Crimean Southern Chernozems in a Field Crop Rotation (Vodno-fizicheskiye svoystva i vodnyy rezhim yuzhnykh chernozemov Kryma v polevom sevooborote),
W73-12744 2G

SMRCHEK, J. C.
Extension of Range of the Triclad Turbellarian Phagocata Gracilis (Haldeman),
W73-12856 2I

SNYDER, R. E.
Back-Surge Technique Improves Well Completions,
W73-12773 8B

SNYTKO, V. A.
Hydrochemical Description of the Onon-Argun' Steppe (Gidrokhimicheskaya kharakteristika Onon-Argunskoy stepi),
W73-12746 2K

SOHNS, V. E.
Treatment of Soybean Oil Soapstock to Reduce Pollution,
W73-12668 5D

SOLI, G.
Selective Substrate Utilization by Marine Hydrocarbonoclastic Bacteria,
W73-12621 5B

SOLLO, F. W. JR
Disinfection of Sewage Effluents,
W73-12504 5D

SOLLY, S. R. B.
DDT in Some New Zealand Marine and Freshwater Fauna,
W73-12925 5A

SOMERTON, W. H.
Well Logs can Indicate Formation Drillability,
W73-12769 8E

SOUTAR, A.
Lead Pollution: Records in Southern California Coastal Sediments,
W73-12589 5B

SOUTHWELL, C. R.
Corrosion of Metals in Tropical Waters—Structural Ferrous Metals,
W73-12772 8G

SPANGLER, W. J.
Degradation of Methylmercury by Bacteria Isolated from Environmental Samples,
W73-12620 5A

SPARKS, R. E.
The Use of Fish as Sensors in Industrial Waste Lines to Prevent Fish Kills,
W73-12889 5C

SPARLING, A. B.
The Monitoring of Organic Matter with Polyurethane Foam,
W73-12868 5A

SPIEGEL, M.
Phosphorus Removal and Plant Operation Studies at Fort Wayne, Indiana,
W73-12500 5D

SPIGARELLI, J. L.
Degradation of Methylmercury by Bacteria Isolated from Environmental Samples,
W73-12620 5A

SPOOR, W. A.
Some Short-Term Indicators of Sublethal Effects of Copper on Brook Trout, Salvelinus Fontinalis,
W73-12859 5C

SPRENT, J. I.
Effects of Water Stress on Nitrogen-Fixing Root Nodules: IV. Effects on Whole Plants of Vicia faba and Glycine max,
W73-12977 3F

SPRINGER, A. M.
Investigation of the Environmental Factors Which Affect the Anaerobic Decomposition of Fibrous Sludge Beds on Stream Bottoms,
W73-12936 5B

SRIVASTAVA, J. P.
Concentration of Fluorine in Potable Water in Bihar Plateau: A Preliminary Survey,
W73-12645 5A

SRIVASTAVA, S. P.
Consumptive Use of Water by Dwarf Wheat in Udaipur Valley,
W73-12387 3F

SRIVASTAVA, V. K.
Effect of Varying Water Management Practices on the Growth, Yield and Nitrogen Uptake by High-Yielding Rice Varieties,
W73-12583 3F

STAHR, E. J.
Antipollution Policies, Their Nature and Their Impact on Corporate Profits,
W73-12695 5G

STAMBERG, J. B.
Activated Sludge Treatment with Oxygen,
W73-12586 5D

STANLEY, S. O.
The Mechanisms of Nitrogen Assimilation in Pseudomonads,
W73-12881 5C

STARKS, R.
Ontario Unhappy with Efforts of Industry to Halt Pollution,
W73-12538 5G

STEFFAN, I.
Determination of Uranium in Urine Specimens Following Their Separation Through Anion Exchange, (Bestimmung Des Urans in Urinproben Nach Dessen Abtrennung Durch Anionenaustausch),
W73-12931 5A

STEVENSON, M. M.
Description and Ecology of Hyaiella Texana N. Sp. (Crustacea: Amphipoda) from the Edwards Plateau of Texas,
W73-12900 2I

STICKNEY, R. R.
Rearing Channel Catfish Fingerlings Under Intensive Culture Conditions,
W73-12488 8I

STILES, J. C.
Some Effects of Evaporation Suppression on Reservoir Ecology,
W73-12869 5C

STOTZKY, G.
Use of Coliphages as Indicators of Water pollution,
W73-12525 5A

STRAND, R. I.
Bureau of Reclamation Procedures for Predicting Sediment Yield,
W73-12479 2J

STROHAL, P.
Thorium in Water and Algae from the Adriatic Sea,
W73-12927 5A

STROM, STEINAR O.
Outline of a Macro-Economic Analysis of Environmental Pollution: A Multi-Sectoral Approach,
W73-12683 6B

STRONG, A. E.
Evaluation of ERTS Data for Certain Oceanographic Uses,
W73-12429 7B

STUART, W. D.
Wind-Driven Model for Evaporite Deposition in a Layered Sea,
W73-12594 2J

STUIBER, D. A.
Waste Water Treatment in Commercial Fish Processing: Reducing Stick Water Loadings,
W73-12420 5D

SUCOFF, E.
Water Potential in Red Pine: Soil Moisture, Evapotranspiration, Crown Position,
W73-12837 2I

SULLIVAN, F. O.
Lithium Silicate Sedimentation Tracer for Shoal Deposit Studies,
W73-12862 5B

SUMMERFELT, R.
Biological Effects of Artificial Destratification and Aeration in Lakes and Reservoirs-Analysis and Bibliography,
W73-12625 5C

SUPP, G. R.
Determination of Lead in Petroleum Additives Using Atomic Absorption Spectrophotometry,
W73-12864 5A

SUTHERLAND, A. A. JR
Variable Sampling Frequency - A New Adaptive Technique,
W73-12616 7B

SWAIN, F. M.
Biogeochemistry of Sediments of Delaware Bay,
W73-12739 2L

SWEENEY, R. A.
Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol II - Biology,
W73-12754 2H

Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol III - Physical,
W73-12755 2H

Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol 1 - Chemistry,
W73-12753 2H

SYERS, J. K.
Phosphate Chemistry in Lake Sediments,
W73-12917 5C

SYKES, R. M.
Identification of the Limiting Nutrient and Specific Growth Rate,
W73-12861 5C

SYMONS, J. M.
An Improved Method For Determining Organics by Activated Carbon Adsorption and Solvent Extraction - Pt. II (Test Method),
W73-12866 5A

TABATABI, M. A.
Determination of Ammonium in Soil Extracts and Water Samples by an Ammonia Electrode,
W73-12939 2G

TACKETT, S. L.
Simultaneous Polarographic Determination of Iron (II) and Iron (III) in Coal Mine Waste Water,
W73-12976 5A

TAGLIAFERRI, G.
Heat-Exchanger for Desalting Sea Water,
W73-12453 3A

TAIRA, H.
Protein Content of Brown Rice by Upland Polyethylene Film Mulching Culture, (In Japanese),
W73-12806 3F

TAKAHASHI, M.
Simulation Study of Phytoplankton Photosynthesis and Growth in the Fraser River Estuary,
W73-12919 5C

TAKATORI, F. H.
Soil Nitrogen Balance in Selected Row-Crop Sites in Southern California,
W73-12670 3F

TANAKA, Y.
Influence of Land Reclamation and Waste Water from Paper Mill on Environment of 'Nori' (Porphyra Tenera) Culture Farm, (In Japanese),
W73-12639 5C

TANEJA, G. C.
Water Metabolism in Desert Sheep, Effects of Various Degrees of Water Restriction on the Distribution of Body Water in Mariwari Sheep,
W73-12788 3F

TANTON, T. W.
Water Pathways in Higher Plants: II. Water Pathways in Roots,
W73-12651 2I

Water Pathways in Higher Plants: III. The Transpiration Stream Within Leaves,
W73-12652 2I

TARDIFF, R. G.
Health Standards for Metals in Drinking Water,
W73-12610 5G

TATTLEMAN, P.
Extremes of Hydrometeors at Altitude for Mil-Std-210B: Supplement--Drop-Size Distributions,
W73-12599 2B

TAYLOR, J. W.
Instrumental and Numerical Considerations for On-Line Interpretation of High Resolution Mass Spectral Data,
W73-12874 2K

THATCHER, M. L.
Prediction of Unsteady Salinity Intrusion in Estuaries: Mathematical Model and User's Manual,
W73-12728 2L

THAYER, J. H.
Method of Reducing Phenolic Waste,
W73-12447 5D

THEOCARIS, P. S.
Stress Distribution Around a Tunnel Situated in a Layer Under the Action of Gravity,
W73-12490 8E

THOMAS, C. D.
Fouling on Eelgrass (Zostera Marina L.),
W73-12631 5G

THOMAS, H. N. III
Simplification of the Blue Mountain Lichen Communities Near a Zinc Factory,
W73-12973 5C

THOMAS, M. P.
A Proposed Streamflow Data Program for Connecticut,
W73-12748 4A

THORNTON, H. T. JR
Tests of Selected Insulating Materials for Mass Concrete,
W73-12431 8F

TIEDEMANN, D. A.
Vertical Dynamic Response of Embeded Footings,
W73-12487 8C

TIMMONS, J. F.
Economics in Soil and Water Conservation,
W73-12691 3F

Identification and Achievement of Environmental Quality Levels in Managing the Use of Natural Resources,
W73-12696 5G

Public Land Use Policy: Needs, Objectives, and Guidelines,
W73-12697 4A

TINKLER, K. J.
The Superimposition Hypothesis for Incised Meanders--A General Rejecton and Specific Test,
W73-12736 2E

TIOVIAINEN, M.
Influence of Water Potential on Growth, Antibiotic Production and Survival of Cephalosporium gramineum,
W73-12999 5B

TITOVA, YE. A.
Silica In Thermal and Cold Waters (Kremnezem v termal'nykh i kholodnykh vodakh),
W73-12751 2K

TOBIN, R. L.
Water Quality in the Middle Fork Feather River, California, May 1970 Through September 1971,
W73-12720 5A

TOENSING, R.
Graphic Displays for Process Insight,
W73-12617 7B

TOERIEN, DAAN
Phosphorus and Eutrophication,
W73-12394 5C

TOETZ, D.
Biological Effects of Artificial Destratification and Aeration in Lakes and Reservoirs-Analysis and Bibliography,
W73-12625 5C

TOMER, P. S.
Cenchrus Ciliaris--A Perennial Pasture Grass of Arid and Semi-Arid Areas,
W73-12790 4A

TOMPKIN, R. B.
Factors Influencing Detection of Salmonellae in Rendered Animal By-Products,
W73-12619 5A

TONGAONKAR, A. S.
Cost Curves for Cross-Drainage Works,
W73-12704 4A

TONOMURA, K.
Ecological Information on the Differences in the Number of Culex tritaeniorhynchus Larvae Among Paddy Fields (In Japanese),
W73-12829 3F

TOTH, S. J.
Effects of Fertilization on Aquatic Plants, Water and Bottom Sediments,
W73-12661 5C

TRAHAN, C. C.
Control of Underseepage by Relief Wells, Trotters, Mississippi; Appendix K: 1969 Pumping Tests,
W73-12597 8B

TRENT, D. S.
Numerical Thermal Plume Model for Vertical Outfalls in Shallow Water,
W73-12506 5B

TUCKER, W. L.
Effects of Stress on Pheasants Previously Given Polychlorinated Biphenyls,
W73-12995 5C

TUNZI, MILTON G.
Algal Bioassays: Examples, Advantages, and Limitations of Current Approaches,
W73-12400 5C

TUREKIAN, K. K.
Trace Element Trapping in Pteropod Tests,
W73-12937 5B

TURNER, A. K.
The Effect of Irrigation Depth on Root Growth of Some Pasture Species,
W73-12834 3F

TURNER, C. W.
The Monitoring of Organic Matter with Polyurethane Foam,
W73-12868 5A

TURNER, J. H.
Influence of Certain Rotations Upon Cotton Production in the San Joaquin Valley,
W73-12975 3F

TUSNEEM, M. E.
Nitrogen Loss from Flooded Soil,
W73-12967 2G

TYLER, J. E.
Optical Properties and Color of Lake Tahoe and Crater Lake,
W73-12926 5A

UDEN, R. H.
Activated Sludge Plant,
W73-12451 5D

UMBARGER, C. J.
Sensitivity and Detectability Limits for Elemental Analysis by Proton-Induced X-Ray Fluorescence with a 3 Mv Van de Graaff,
W73-12935 5A

URIU, K.
Antitranspirant Film: Curtailing Intake of External Water by Cherry Fruit to Reduce Cracking,
W73-12992 2D

USENKO, V. S.
Artificial Recharge of Groundwater and Infiltration Basins (Iskusstvennoye vospolneniye zapasov i infil'tratsionnyye vodozabory podzemnykh vod),
W73-12745 4B

UTHE, J. F.
Uptake of Mercury by Caged Rainbow Trout (Salmo Gairdneri) in the South Saskatchewan River,
W73-12857 5C

VAHTRAS, K.
Determination of Exchangeable Cations in Calcareous Soils,
W73-12786 2G

VALERIE, V. R.
Water Pollution Potential of Manufactured Products--Catalog Section I,
W73-12671-1 5G

Water Pollution Potential of Manufactured Products--Catalog Section II, Product Listing,
W73-12671-2 5G

Water Pollution Potential of Manufactured Products--Catalog Section III, Chemical Ingredient Listing,
W73-12671-3 5G

VAN DENBURGH, A. S.
Sources of Data for Evaluation of Selected Geothermal Areas in Northern and Central Nevada,
W73-12947 4B

VAN DER KEVIE, W.
Morphology, Genesis, Occurrence and Agricultural Potential of Acid Sulphate Soils in Central Thailand,
W73-12818 2G

VANDER VELDE, T. L.
Poliovirus in a Water Supply,
W73-12922 5B

VARSHNEY, R. S.
Stresses in the Body and Foundations of Prestressed Dams,
W73-12475 8A

VERGNAUD, J. P.
Tritium and Deuterium Content of the Snow in Groenland,
W73-12418 5B

VERMA, G. P.
Effect of Compaction on Yield and Uptake of N, P and K by Maize (Zea mays L.),
W73-12660 3F

Influence of Different Moisture Regimes and Methods of Phosphate Application on Growth and Nutrient Absorption by Wheat (Triticum Aestivum L.),
W73-12539 3F

VERMEER, K.
The Crayfish, Orconectes Virilis, As an Indicator of Mercury Contamination,
W73-12632 5A

VERSHININA, L. K.
Factors Producing the Outstanding Spring Flood of 1970 in Upper Don River Basins (Usloviya formirovaniya vydayushchegosya vesennego polovod'ya 1970 g. v basseynakh rek verkhnego Dona),
W73-12440 2E

Methods of Determining Soil Moisture Storage in Winter (K metodike opredeleniya vlagozapasov pochvy v zimniy period goda),
W73-12444 2G

VIESSMAN, W. JR
Hydrologic Models for Poorly Defined Drainage Areas,
W73-12496 2A

VINCENT, M.
Classification of the Coastal Environments of the World: Part II. Africa,
W73-12950 2L

VISSER, S. A.
Flow of Microbially Fixed Nitrogen in a Model Ecosystem,
W73-12847 5B

VISWANATH, G. K.
Significance of Heating Agricultural Soils,
W73-12802 3F

VOIGT, A. F.
Sodium Tungsten Bronze as a Potentiometric Indicating Electrode for Dissolved Oxygen in Aqueous solution,
W73-12873 5A

WADDINGTON, D. V.
Growth and Chemical Composition of Eight Grasses Grown Under High Water Table Conditions,
W73-12972 2I

WAGGY, G. T.
Identification and Control of Petrochemical Pollutants Inhibitory to Anaerobic Processes,
W73-12513 5D

WAGNER, S. L.
Arsenic and Cadmium in the Environment,
W73-12607 5C

WAHLS, H. E.
Time Effects on Dynamic Shear Modulus of Clays,
W73-12477 2G

WAHLUND, L. G.
Volatile Biochemical Oxygen-Consuming Materials Occurring in the Sulfite Process with Liquor Neutralization and Condensate Recovery: Theoretical Study, (Flyktiga biokemisk syreforbrukande amnens upptradande i sulfitprocessen vid lutneutralisering och kondensataterforing, Teoretisk undersokning),
W73-12546 5D

WALDEN, C. C.
Microbiological Treatment Parameters of Bleached Kraft Pulp Mill Effluents,
W73-12551 5D

WALKER, W. R.
Coordination of Agricultural and Urban Water Quality Management in the Utah Lake Drainage Area,
W73-12508 5G

Evaluation of Urban Water Management Policies in the Denver Metropolitan Area,
W73-12510 5G

Generalized Discharge Relations for Cutthroat Flumes,
W73-12474 8B

Mathematical Modeling of Water Management Strategies in Urbanizing River Basins,
W73-12509 5G

WALLACE, A.
Sodium Relations in Desert Plants: 1. Cation Contents of Some Plant Species from the Mojave and Great Basin Deserts,
W73-12792 2I

Sodium Relations in Desert Plants: 2. Distribution of Cations in Plant Parts of Three Different Species of Atriplex,
W73-12793 2I

WALLACE, D. A.
Impact of Water Fluoridation on Dental Practice and Dental Manpower,
W73-12816 5F

WALLACE, J. B.
The Benthic Fauna in Four Small Southern Appalachian Streams,
W73-12784 2I

WALLER, W. T.
The Use of Fish as Sensors in Industrial Waste Lines to Prevent Fish Kills,
W73-12889 5C

WALSH, J. T.
Application of Liquid Chromatography to Pollution Abatement Studies of Munition Wastes,
W73-12877 5A

WARD, F. J.
A Comparison of Liquid Scintillation and Geiger-Muller Estimates of Primary Productivity in an in Situ Experiment,
W73-12848 5A

WARD, P. R. B.
Prediction of Mixing Lengths for River Flow Gaging,
W73-12414 5B

WARD, R. C.
Evaluation of Urban Water Management Policies in the Denver Metropolitan Area,
W73-12510 5G

WARE, D. M.
Predation by Rainbow Trout (Salmo Gairdneri): The Influence of Hungar, Prey Density and Prey Size,
W73-12836 8I

WARNER, D. L.
Survey of Industrial Waste Injection Wells, Volume II,
W73-12576 5E

WASSERMAN, R.
Heated Sensors for Flow Measurements,
W73-12618 7B

WATERS, T. F.
Annual Production of a Stream Mayfly Population: A Comparison of Methods,
W73-12905 5B

WEBB, P. W.
The Effects of Sublethal Concentrations of Whole Bleached Kraftmill Effluent on the Growth and Food Conversion Efficiency of Underyearling Sockeye Salmon (Oncorhynchus nerka),
W73-12913 5C

WECHTER, M. A.
Sodium Tungsten Bronze as a Potentiometric Indicating Electrode for Dissolved Oxygen in Aqueous solution,
W73-12873 5A

WEDEMEYER, G.
Public Support of Private Water Resource Development in Agriculture--With Implications for Firm Growth,
W73-12698 4B

WEHKING, M. W.
Stabilization of Sewage Solids by the Channel Aeration Process,
W73-12502 5D

WEINER, J.
Water Pollution in the Pulp and Paper Industry. I. General and In-Plant Modifications,
W73-12553 5D

Water Pollution in the Pulp and Paper Industry. II. Testing Methods,
W73-12554 5A

Water Pollution in the Pulp and Paper Industry. III. Stream Response,
W73-12555 5C

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. A. Physical Operations,
W73-12556 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. B. Biological Systems,
W73-12557 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. C. Chemical Processes, General Observations, and Reports,
W73-12558 5D

WELDON, M. R.
Preimpoundment Study of West Point Lake, Georgia,
W73-12376 5C

WELLS, C.
Investigation of Mineral Nutrient Cycling in Upland Piedmont Forest,
W73-12700 4A

WELTY, J. R.
Numerical Thermal Plume Model for Vertical Outfalls in Shallow Water,
W73-12506 5B

WESWIG, P. H.
Selenium in the Environment,
W73-12614 5C

WHIGHAM, D.
Investigation of Mineral Nutrient Cycling in Upland Piedmont Forest,
W73-12700 4A

WHITFIELD, P.
The Reduction of Copper Toxicity in a Marine Copepod by Sediment Extract,
W73-12909 5C

WHITNEY, R. R.
Water Temperature and the Migrations of American Shad,
W73-12666 2I

WHITSELL, W. J.
Pitless Units and Adapters,
W73-12776 8G

WIESERMAN, L. F.
Simultaneous Polarographic Determination of Iron (II) and Iron (III) in Coal Mine Waste Water,
W73-12976 5A

WILHM, J.
Biological Effects of Artificial Destratification and Aeration in Lakes and Reservoirs-Analysis and Bibliography,
W73-12625 5C

WILLIAMS, A. B.
A Hydrographic Atlas of Larger North Carolina Sounds,
W73-12948 2L

WILLIAMS, D. C. JR
Economic and Related Impacts of Rural Water Systems in Mississippi,
W73-12493 6B

WILLIAMS, L. G.
Stream-Velocity Effects on the Heavy-Metal Concentrations,
W73-12870 5B

WILLIAMS, R. O.
Investigations on American Shad in the St. Johns River,
W73-12370 2H

WILLIAMS, W. A.
Influence of Certain Rotations Upon Cotton Production in the San Joaquin Valley,
W73-12975 3F

WILSON, J. H.
The Effect of Irrigation Depth on Root Growth of Some Pasture Species,
W73-12834 3F

WINAR, R. M.
The Disposal of Wastewater Underground,
W73-12781 5E

WINDOM, H. L.
Mercury Distribution in Estuarine-Nearshore Environment,
W73-12920 5B

WISE, G. G.
Water Quality Hydrology of Lands Receiving Farm Animal Wastes,
W73-12353 5B

WITKAMP, M.
Flow of Microbially Fixed Nitrogen in a Model Ecosystem,
W73-12847 5B

WIUM-ANDERSEN, S.
The Influence of Vegetation on the Redox Profile in the Sediment of Grane Langso, A Danish Lobelia Lake,
W73-12379 5C

WOLF, K.
Fish Viruses: Histopathologic Changes Associated with Experimental Channel Catfish Virus Disease,
W73-12382 5C

WOLFE, H. G.
A Comparison of Rates of Water Loss Through Transpiration of Several Southern New Mexico Phreatophyte Species,
W73-12497 2D

WOLK, C. P.
Physiology and Cytological Chemistry of Blue-Green Algae,
W73-12845 5C

WOLKOFF, F. D.
Behavior of the Goldfish as an Early Warning System for the Presence of Pollutants in Water,
W73-12916 5A

WOODALL, W. R. JR
The Benthic Fauna in Four Small Southern Appalachian Streams,
W73-12784 2I

WOODRUFF, K. D.
Geohydrology of the Dover Area, Delaware,
W73-12425 7C

WOODS, L. A. JR
DDT Residues in White Croakers,
W73-12835 5C

WOODS, W. J.
A Hydrographic Atlas of Larger North Carolina Sounds,
W73-12948 2L

WRIGHT, J. F.
The Distribution of Stream-Dwelling Triclads (Platyhelminthes) in North Wales,
W73-12971 2I

WRIGHT, L. D.
Process-Form Variability of Multiclass Coasts: Baja California,
W73-12422 2L

WUYCHECK, J. C.
The Utilization of Leaf Litter by Stream Detritivores,
W73-12882 5C

YAMADA, H.
Influence of Certain Rotations Upon Cotton Production in the San Joaquin Valley,
W73-12975 3F

YOSHIDA, M.
Ecological Information on the Differences in the Number of Culex tritaeniorhynchus Larvae Among Paddy Fields (In Japanese),
W73-12829 3F

YOST, E. F.
An Interdisciplinary Study of the Estuarine and Coastal Oceanography of Block Island Sound and Adjacent New York Coastal Waters,
W73-12629 5A

YOTOV, I. G.
Flow to Wells Near Streams in the Presence of Delayed Yield From Storage and Analysis of Pumping Test Data,
W73-12943 4B

YOUNG, B. M.
Here's a New Sand Pack Method,
W73-12761 8G

YURCHYK, J.
Biomass Characteristics of the Asidian Molgula Manhattensis (Dekay),
W73-12880 5A

ZABIK, M. J.
Biologically Active Compounds in the Aquatic Environment: The Uptake and Distribution of (1,1-Dichloro-2,2-Bis (P-Chlorophenyl) Ethylene), DDE by Chironomus tentans Fabricius (Diptera: Chironomidae),
W73-12804 5B

ZADOROJNY, C.
Spectrophotometric Determination of Ammonia,
W73-12886 5A

ZAGHLOOL, E. R. F.
Strength Analysis of Corner Column-Slab Connections,
W73-12465 8A

ZANKER, A.
Nomograph for Hydraulic Conductivity and Intrinsic Permeability of Water-Soil System,
W73-12808 2G

Nomograph for the Saturation Percentage of Soil,
W73-12807 2G

ZEPP, P.
Regional Sewer System, Planning and Cost Estimation Model,
W73-12357 5G

ZERBE, J. J.
Pollutant Recovery System,
W73-12456 5G

ZIMMERMAN, T. L.
Growth and Chemical Composition of Eight Grasses Grown Under High Water Table Conditions,
W73-12972 2I

ORGANIZATIONAL INDEX

ABERDEEN UNIV. (SCOTLAND). SCHOOL OF AGRICULTURE.
Fungi Colonizing Wood Submerged in the Medway Estuary,
W73-12825 2L

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, BENEDICT, MD. BENEDICT ESTUARINE LAB.
Mortality Curves of Bluegills (Lepomis Macrochirus Rafinesque) Simultaneously Exposed to Temperature and Zinc Stress,
W73-12637 5C

AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD. PLANT SCIENCE RESEARCH DIV.
Resistance in Digitaria to Yellow Sugarcane Aphid, Siphaflava (Forbes) as Related to Temperature and Rainfall,
W73-12643 2I

AGRICULTURAL RESEARCH SERVICE, BRAWLEY, CALIF.
Field Leaching by Sprinkler and Surface Irrigation During a Crop Season,
W73-12464 3F

AGRICULTURAL RESEARCH SERVICE, BURLINGTON, VT. SOIL AND WATER CONSERVATION RESEARCH DIV.
Considerations for Effective Sloping Land Drainage Systems,
W73-12933 4A

AGRICULTURAL RESEARCH SERVICE, COLLEGE STATION, TEX. PLANT SCIENCE RESEARCH DIV.
Auger Soil Sampler for Herbicide Residues,
W73-12794 2G

AGRICULTURAL RESEARCH SERVICE, LAFAYETTE, IND.
Stone and Woodchip Mulches for Erosion Control on Construction Sites,
W73-12463 4D

AGRICULTURAL RESEARCH SERVICE, PEORIA, ILL. NORTHERN REGIONAL RESEARCH LAB.
Treatment of Soybean Oil Soapstock to Reduce Pollution,
W73-12668 5D

AGRICULTURAL RESEARCH SERVICE, SHAFTER, CALIF. COTTON RESEARCH STATION.
Influence of Certain Rotations Upon Cotton Production in the San Joaquin Valley,
W73-12975 3F

AIR FORCE CAMBRIDGE RESEARCH LABS., L. G. HANSCOM FIELD, MASS.
Extremes of Hydrometeors at Altitude for Mil-Std-210B: Supplement--Drop-Size Distributions,
W73-12599 2B

AKRON UNIV., OHIO. DEPT. OF BIOLOGY.
The Annual Cycle of Small Mammal Populations on a Zambian Floodplain,
W73-12814 2I

ALABAMA MARINE RESOURCES LAB., DAUPHIN ISLAND.
The Effect of Floodwater on Oysters in Mobile Bay,
W73-12658 5C

ALABAMA UNIV., BIRMINGHAM. INST. OF DENTAL RESEARCH.
Aqueous Iron-Sulfur Systems in Rice Field Soils of Louisiana,
W73-12385 3F

ALABAMA UNIV., UNIVERSITY. DEPT. OF BIOLOGY.
Stream-Velocity Effects on the Heavy-Metal Concentrations,
W73-12870 5B

ALASKA UNIV., COLLEGE. INST. OF MARINE SCIENCE.
The Kinetics of Microbiological Modification of Organic Substances in Natural Waters,
W73-12712 5B

AMERICAN SOCIETY OF CIVIL ENGINEERS, NEW YORK. COMMITTEE ON GROUTING.
Guide Specification for Chemical Grouts.
W73-12782 8G

AMERICAN SOCIETY OF CIVIL ENGINEERS, NEW YORK. TASK COMMITTEE ON LIGHTWEIGHT ALLOYS.
Guide for the Design of Aluminum Transmission Towers.
W73-12485 8C

AMES LAB., IOWA.
Sodium Tungsten Bronze as a Potentiometric Indicating Electrode for Dissolved Oxygen in Aqueous solution,
W73-12873 5A

AMOCO PRODUCTION CO., TULSA, OKLA.
Micellar Solutions Stimulate Wells,
W73-12762 8B

AMSTERDAM UNIV. (NETHERLANDS). LAB. OF ANIMAL PHYSIOLOGY.
A Nitrogen Correction for Caloric Values,
W73-12383 5A

ANGPANNEFORENINGEN, STOCKHOLM (SWEDEN).
Volatile Biochemical Oxygen-Consuming Materials Occurring in the Sulfite Process with Liquor Neutralization and Condensate Recovery: Theoretical Study, (Flyktiga biokemisk syreforbrukande amnens upptradande i sulfitprocessen vid lutneutralisering och kondensataterforing, Teoretisk undersokning),
W73-12546 5D

ARIZONA GAME AND FISH DEPT., FLAGSTAFF.
Responses od Deer and Elk to Beaver Creek Watershed Treatments,
W73-12405 4D

ARIZONA STATE UNIV., TEMPE. DEPT. OF BOTANY AND MICROBIOLOGY.
Simplification of the Blue Mountain Lichen Communities Near a Zinc Factory,
W73-12973 5C

ARIZONA WATER COMMISSION, PHOENIX.
Sixteenth Annual Arizona Watershed Symposium Proceedings.
W73-12403 4D

ARMY ENGINEER DISTRICT, NEW YORK.
Maintenance of the Hudson River Channel, New York, Navigation Project, (Final Environmental Statement).
W73-12588 8B

ARMY ENGINEER DISTRICT, PHILADELPHIA, PA.
Final Environmental Statement: Small Beach Erosion Control Project, Broadkill Beach, Delaware.
W73-12430 8B

ARMY ENGINEER, WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Tests of Selected Insulating Materials for Mass Concrete,
W73-12431 8F

Time Effects on Dynamic Shear Modulus of Clays,
W73-12477 2G

Wave Damping Effects of Fibrous Screens; Hydraulic Model Investigation,
W73-12564 8B

Disposal of Dredge Spoil; Problem Identification and Assessment and Research Program Development,
W73-12573 4A

Grays Harbor Estuary, Washington: Report 2. North Jetty Study,
W73-12581 8B

Control of Underseepage by Relief Wells, Trotters, Mississippi; Appendix K: 1969 Pumping Tests,
W73-12597 8B

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS. HYDRAULIC LAB.
Wave Transmission Through Rock Structures; Hydraulic Model Investigation,
W73-12563 8B

Effects of Proposed Dock Expansion at Newport News on Tides, Currents, and Shoaling; Hydraulic Model Investigation,
W73-12566 8B

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS. HYDRAULICS LAB.
Reflection Characteristics of Screen Wave Absorbers; Hydraulic Model Investigation,
W73-12561 8B

Mathematical Simulation of the Turbidity Structure within an Impoundment; Hydraulic Laboratory Investigation,
W73-12562 8B

Effective Hydraulic Roughness for Channels Having Bed Roughness Different from Bank Roughness; A State-Of-The-Art Report,
W73-12565 8B

Sea-Land Navigation Studies; Hydraulic Model Investigation,
W73-12567 8B

Outlet Works Stilling Basin for Tallahala Dam, Tallahala Creek, Mississippi; Hydraulic Model Investigation,
W73-12568 8B

Selective Withdrawal from Man-Made Lakes, Hydraulic Laboratory Ivestigation,
W73-12569 4A

Shoaling Conditions, St. Louis Harbor, Mississippi River; Hydraulic Model Investigation,
W73-12570 8B

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG,

Navigation Channel Improvement, Gastineau Channel, Alaska; Hydraulic Model Investigation,
W73-12571 8A

Effects of Submerged Sills in the St. Clair River; Hydraulic Model Investigation,
W73-12572 8B

Spillway for Oakley Dam, Sangamon River, Illinois-Appendix A: Type 2 (Revised) Spillway,
W73-12582 8A

ARMY MEDICAL ENVIRONMENTAL ENGINEERING RESEARCH UNIT, EDGEWOOD ARSENAL, MD.

The Evaluation of Existing Field Test Kits for Determining Free Chlorine Residuals in Aqueous Solutions,
W73-12426 5A

ARMY NATICK LABS., MASS. PIONEERING RESEARCH LAB.

Application of Liquid Chromatography to Pollution Abatement Studies of Munition Wastes,
W73-12877 5A

ASIAN INST. OF TECH., BANGKOK (THAILAND).

Reuse of Human Wastes in Agriculture,
W73-12817 5D

ATLANTIC RICHFIELD CO., BAKERSFIELD, CALIF.

Comparison of Waterflood Corrosion Detection and Monitoring Devices,
W73-12757 8G

ATOMIC ENERGY COMMISSION, WASHINGTON, D.C. (ASSIGNEE)

Cross-Flow Filtration Process for Removal of Total Organic Carbon and Phosphates from Aqueous Sewage Effluents,
W73-12460 5D

ATOMIC ENERGY OF CANADA LTD., CHALK RIVER (ONTARIO. ENVIRONMENTAL RESEARCH BRANCH.

Membrane Filter Retention--A Source of Error in the C-14 Method of Measuring Primary Production,
W73-12908 5A

AUBURN UNIV., ALA. DEPT. OF FISHERIES AND ALLIED AQUACULTURES.

Sources of CO2 for Nuisance Blooms of Algae,
W73-13000 5C

AUSTRALIAN NATIONAL UNIV., CANBERRA. DEPT. OF BOTANY.

The Selection of Eucalpts for Regeneration,
W73-12980 2I

AUSTRALIAN NATIONAL UNIV., CANBERRA. SCHOOL OF GENERAL STUDIES.

Frost Resistance in Eucalyptus: A New Method for Assessment of Frost Injury in Altitudinal Provenances of E. Viminalis,
W73-12815 2I

BANARAS HINDU UNIV., VARANASI (INDIA). DEPT. OF SOIL SCIENCE AND AGRICULTURAL CHEMISTRY.

Effect of Quality of Well Waters on the Germination and Mineral Composition of Wheat on Saline-Sodic Soils Rich in Magnesium,
W73-12809 3C

BARI UNIV. (ITALY). INSTITUTO DI MERCEOLOGIA.

Economic Effects of Technology Changes in Relation to the Environment,
W73-12685 6B

BATTELLE COLUMBUS LABS., OHIO.

Photosulfoxidation of Hydrocarbons in the Liquid Phase,
W73-12833 2K

BECHTEL CORP., SAN FRANCISCO, CALIF.

New Trends in Waste Water Treatment and Recycle,
W73-12533 5D

BECKMAN INSTRUMENTS, INC., FULLERTON, CALIF. ADVANCED TECHNOLOGY OPERATIONS.

Additional Studies for the Spectrophotometric Measurement of Iodine in Water.
W73-12851 5A

BEDFORD INST., DARTMOUTH (NOVA SCOTIA).

Annual Life Cycle and Production of the Chaetognath Sagitta elegans in Bedford Basin, Nova Scotia,
W73-12898 5B

BEDFORD INST., DARTMOUTH (NOVA SCOTIA). MARINE ECOLOGY LAB.

Predation by Rainbow Trout (Salmo Gairdneri): The Influence of Hungar, Prey Density and Prey Size,
W73-12836 8I

BENDIX CORP., KANSAS CITY, MO.

A Method for High Speed BCD-to-Binary Conversion,
W73-12892 7C

BIRMINGHAM UNIV. (ENGLAND). DEPT. OF CIVIL ENGINEERING.

Long Wave Propagation in Idealized Estuary,
W73-12417 2L

BLACK AND VEATCH, KANSAS CITY, MO.

Report on Arkansas Valley Conduit for Southeastern Colorado Water Conservancy District, Four Corners Regional Commission and U.S. Bureau of Reclamation.
W73-12577 4A

BOWLING GREEN STATE UNIV., OHIO. DEPT. OF BIOLOGY.

Diatom Population Dynamics in a Central Iowa Drainage Ditch,
W73-12665 5C

BRITISH COLUMBIA RESEARCH COUNCIL, VANCOUVER.

Microbiological Treatment Parameters of Bleached Kraft Pulp Mill Effluents,
W73-12551 5D

BRITISH COLUMBIA UNIV., VANCOUVER.

Reservoir-Yield Estimation Procedures,
W73-12478 4A

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF CIVIL ENGINEERING.

Prediction of Mixing Lengths for River Flow Gaging,
W73-12414 5B

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF SOIL SCIENCE.

Application of Acrylic Plastic Tension Lysimeters to Sloping Land,
W73-12638 2G

Average Bowen-Ratio Methods of Calculating Evapotranspiration Applied to a Douglas Fir Forest,
W73-12801 2D

BRITISH COLUMBIA UNIV., VANCOUVER. INST. OF ANIMAL RESOURCE ECOLOGY.

Some Effects of Artificial Fertilization on Enclosed Plankton Populations in Marion Lake, British Columbia,
W73-12384 5C

BRITISH COLUMBIA UNIV., VANCOUVER. INST. OF OCEANOGRAPHY.

The Reduction of Copper Toxicity in a Marine Copepod by Sediment Extract,
W73-12909 5C

Simulation Study of Phytoplankton Photosynthesis and Growth in the Fraser River Estuary,
W73-12919 5C

BROWN AND CALDWELL, INC., SAN FRANCISCO, CALIF.

Nutrient Control in North San Francisco Bay,
W73-12398 5C

BULGARIAN ACADEMY OF SCIENCES, SOFIA. GEOLOGICAL INST.

Flow to Wells Near Streams in the Presence of Delayed Yield From Storage and Analysis of Pumping Test Data,
W73-12943 4B

BUREAU OF MINES, LARAMIE, WYO. LARAMIE ENERGY RESEARCH CENTER.

Polyaromatic Hydrocarbons in High-Boiling Petroleum Distillates. Isolation by Gel Permeation Chromatography and Identification by Fluorescence Spectrometry,
W73-12875 5A

BUREAU OF MINES, WASHINGTON, D.C.

Environmental Cost of Mining,
W73-12687 5G

BUREAU OF RECLAMATION, DENVER, COLO.

An Electric Conversion for Mechanical Hydraulic Governors of Water Wheel Turbines,
W73-12469 8C

Heuristic Ranking and Prioritizing Under Subjective Conductions,
W73-12470 6B

Bureau of Reclamation Procedures for Predicting Sediment Yield,
W73-12479 2J

Vertical Dynamic Response of Embeded Footings,
W73-12487 8C

BUREAU OF SPORT FISHERIES AND WILDLIFE, COLUMBIA, MO. FISH-PESTICIDE RESEARCH LAB.

Use of Cold Brands on Channel Catfish,
W73-12778 8I

BUREAU OF SPORT FISHERIES AND WILDLIFE, KEARNEYSVILLE, W. VA. EASTERN FISH DISEASE LAB.

Fish Viruses: Histopathologic Changes Associated with Experimental Channel Catfish Virus Disease,
W73-12382 5C

CALGARY UNIV. (ALBERTA).

Strength Analysis of Corner Column-Slab Connections,
W73-12465 8A

CALIFORNIA INST. OF TECH., PASADENA.
Transport of Heavy Metals Through the Air Environment,
W73-12609 5B

CALIFORNIA STATE DEPT. OF FISH AND GAME, SACRAMENTO.
DDT Residues in White Croakers,
W73-12835 5C

Primary Productivity in a New and an Older California Reservoir,
W73-12998 8I

CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO.
Proceedings of Seminar on Eutrophication and Biostimulation.
W73-12391 5C

Phosphorus and Eutrophication,
W73-12394 5C

Effects of Light and Temperature on Algal Growth,
W73-12396 5C

AGP Studies in the San Francisco Bay-Delta,
W73-12401 5C

CALIFORNIA STATE UNIV., FRESNO.
Peruvian Fisheries: Conservation and Development.
W73-12689 6B

CALIFORNIA STATE UNIV., HUMBOLDT, ARCATA.
A Pilot Fish-Pond System for Utilization of Sewage Effluents, Humboldt Bay, Northern California,
W73-12434 5D

CALIFORNIA UNIV., BERKELEY.
Well Logs can Indicate Formation Drillability,
W73-12769 8E

CALIFORNIA UNIV., BERKELEY. DEPT. OF SOILS AND PLANT NUTRITION.
Nutrient Uptake by Tupelo Gum and Bald Cypress from Saturated or Unsaturated Soil,
W73-12828 2I

CALIFORNIA UNIV., BERKELEY. MUSEUM OF VERTEBRATE ZOOLOGY.
The Effects of Diesel Fuel on a Stream Fauna,
W73-12997 5C

CALIFORNIA UNIV., DAVIS. DEPT. OF IRRIGATION.
Simplified Solution for Decreasing Flow in Wells,
W73-12759 8B

CALIFORNIA UNIV., DAVIS. DEPT. OF WATER SCIENCE AND ENGINEERING.
Antitranspirant Film: Curtailing Intake of External Water by Cherry Fruit to Reduce Cracking,
W73-12992 2D

Antitranspirants for Conservation of Leaf Water Potential of Transplanted Citrus Trees,
W73-12993 2D

Relative Water Content of Leaves: Underestimation Caused by Antitranspirant Film,
W73-12994 2D

CALIFORNIA UNIV., DAVIS., DIV. OF ENVIRONMENTAL STUDIES.
The Role of Zooplankton in the Process of Eutrophication,
W73-12397 5C

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Sodium Relations in Desert Plants: 1. Cation Contents of Some Plant Species from the Mojave and Great Basin Deserts,
W73-12792 2I

Sodium Relations in Desert Plants: 2. Distribution of Cations in Plant Parts of Three Different Species of Atriplex,
W73-12793 2I

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL SCIENCE.
Soil Nitrogen Balance in Selected Row-Crop Sites in Southern California,
W73-12670 3F

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL SCIENCE AND AGRICULTURAL ENGINEERING.
Water Vapor Adsorption by Water-Repellent Soils at Equilibrium,
W73-12968 2G

CALIFORNIA UNIV., SANTA BARBARA.
Investigation of the Nature, Extent and Fate of Natural Oil Seepage Off Southern California,
W73-12958 5B

CANADIAN FOREST SERVICE, EDMONTON (ALBERTA).
Estimating Snow-Water Equivalent from Point-Density Measurements of Forest Stands,
W73-12827 4A

CANADIAN WILDLIFE SERVICE, EDMONTON (ALBERTA).
The Crayfish, Orconectes Virilis, As an Indicator of Mercury Contamination,
W73-12632 5A

CANDEUB, FLEISSIG AND ASSOCIATES, NEWARK, N.J.
Interim Areawide Water and Sewer Plan: Bel-O-Mar area.
W73-12362 5G

CARLETON UNIV., OTTAWA (ONTARIO).
High Strength Bolted Galvanized Joints,
W73-12489 8G

CASE WESTERN RESERVE UNIV., CLEVELAND, OHIO. SYSTEMS RESEARCH CENTER.
The Development of a Regional Systems Oriented Water Management Model: A Tool for Policy Analysis,
W73-12839 6A

CEMENTATION CO. LTD., LONDON (ENGLAND).
Leaching of Cement from a Concrete Pile Section by Groundwater Flow,
W73-12766 8F

CENTER FOR THE ENVIRONMENT AND MAN, INC., HARTFORD, CONN.
Simulations of Meteorological Variations Over Arctic Coastal Tundra Under Various Physical Interface Conditions,
W73-12983 2B

CENTRAAL BUREAU VOOR DE STATISTIEK, THE HAGUE (NETHERLANDS).
The Set up of the Statistical System Within Which the Deterioration of the Human Environment will be Estimated,
W73-12681 6B

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Water Metabolism in Desert Sheep, Effects of Various Degrees of Water Restriction on the Distribution of Body Water in Mariwari Sheep,
W73-12788 3F

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Insecticide Residues in Water and Sediment from Cisterns on the U.S. and British Virgin Islands - 1970,
W73-12894 5B

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Leaching Salty Soils,
W73-12789 2G

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The Problem of Color Measurement for Pulp Manufacturing Effluents (Le probleme de la mesure de couleur des effluents de fabrication des pates),
W73-12526 5G

CENTRO DE EDAFOLOGIA Y BIOLOGIA APLICADA DEL SEGURA, MURCIA (SPAIN).
Determination of Exchangeable Cations in Calcareous Soils,
W73-12786 2G

CHAM/HILL, CORVALLIS, OREG.
Spectrophotometric Determination of Ammonia,
W73-12886 5A

CHANCELLOR COLL., LIMBE (MALAWI).
The Lake Chilwa Tilapia and Its Fishery,
W73-12642 2H

CHEMSTRAND CORP., PENSACOLA, FLA. UTILITIES ASSISTANCE GROUP.
The Design and Operation of Deep-Well Disposal System,
W73-12780 5E

CHICAGO BOARD OF HEALTH, ILL.
Viruses in Metropolitan Waters: Concentration by Polyelectrolytes, Freeze Concentration, and Ultrafiltration,
W73-12867 5F

CHICAGO, ILL.
The Lakefront Plan of Chicago.
W73-12367 4C

CINCINNATI UNIV., OHIO. COLL. OF MEDICINE.
Biological Aspects of Lead: An Annotated Bibliography - Literature From 1950 through 1964. Parts I and II,
W73-12627 5C

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Nitrogen: Recent Studies on the Role of Nitrogen in the Biostimulation and Eutrophication of Aquatic Ecosystems,
W73-12393 5C

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Mathematical Modeling for Environmental Pollution Control,
W73-12711 5G

CLEMSON UNIV., S.C. DEPT. OF ENVIRONMENTAL SYSTEMS ENGINEERING; AND CLEMSON UNIV., S.C. DEPT OF ECONOMICS.
Determination of Public Environmental Preferences in Water Resources Planning and Development,
W73-12706 6B

COAST GUARD, WASHINGTON, D.C. MARINE ENVIRONMENTAL PROTECTION DIV.
Proposed Oil Pollution Regulations, (Final Environmental Statement).
W73-12955 5G

COLLEGE OF AGRICULTURE, DHARWAR (INDIA).
Consumptive Use of Water by Cotton Grown in Transition Tract of Dharwar Under Rainfed Conditions,
W73-12988 3F

COLORADO SPRINGS DEPT. OF PUBLIC WORKS, COLO. WATER DIV.
Cathodic Protection for Coated Steel Pipelines,
W73-12765 8G

COLORADO STATE UNIV., FORT COLLINS.
Generalized Discharge Relations for Cutthroat Flumes,
W73-12474 8B

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF AGRICULTURAL ENGINEERING.
Computing Backwater at Open Channel Constrictions,
W73-12415 8B

Improvements in Moving Sprinkler Irrigation Systems for Conservation of Water,
W73-12507 3F

COLORADO STATE UNIV., FORT COLLINS. ENVIRONMENTAL RESOURCES CENTER.
Coordination of Agricultural and Urban Water Quality Management in the Utah Lake Drainage Area,
W73-12508 5G

Mathematical Modeling of Water Management Strategies in Urbanizing River Basins,
W73-12509 5G

Evaluation of Urban Water Management Policies in the Denver Metropolitan Area,
W73-12510 5G

COLORADO UNIV., BOULDER.
New Techniques for Participative Planning in Water Resources,
W73-12472 6B

Bearing Capacity of Footings in Plane Strain,
W73-12484 8D

COMMISSARIAT GENERAL AU PLAN, PARIS (FRANCE).
Environmental Quality Indicators and Social Indicators,
W73-12679 6B

COMMITTEE ON CHANNEL STABILIZATION (ARMY).
Chena River Lakes Project, Alaska, Problems Relating to Channel Development, Erosion, and Bank and Levee Protection,
W73-12559 8B

COMMITTEE ON TIDAL HYDRAULICS (ARMY), WASHINGTON, D.C.
Delaware Estuary, Peansylvania, New Jersey, and Delaware, Long-Range Dredged Spoil Disposal Problem.
W73-12560 5E

Estuarine Navigation Projects.
W73-12575 8B

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Bacteria of Muds Colonized by Spartina Townsendii and their Possible Role in Spartina Die-Back,
W73-12705 2L

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA).
Theory of Water Movement in Soils: 10. Cavities with Constant Flux,
W73-12600 2G

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV. OF LAND RESEARCH.
High-Altitude Forests and Grasslands of Mt. Albert Edward, New Guinea,
W73-12824 4A

COMPAGNIE NATIONALE DU RHONE, LYON (FRANCE).
The Multipurpose Development of the River Rhone Valley,
W73-12467 4A

CONNECTICUT UNIV., STORRS. DEPT. OF CIVIL ENGINEERING.
Factors Affecting the Percolation Test,
W73-12716 5B

CONNECTICUT UNIV., STORRS. DEPT. OF PLANT SCIENCE.
Effect of Time, Water Flow and pH on Centripetal Passage of Radiophosphorus Across Roots of Intact Plants,
W73-12991 5B

CONSOLIDATED FOODS CORP., HAYWARD, CALIF. SHASTA BEVERAGES DIV.
Wastewater Treatment System,
W73-12455 5D

CONSOLIDATION COAL CO., PINCKNEYVILLE, ILL. MIDWESTERN DIV.
Control of Mine Drainage from Coal Mine Mineral Wastes - Phase II - Pollution Abatement and Monitoring,
W73-12516 5G

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The Influence of Vegetation on the Redox Profile in the Sediment of Grane Langso, A Danish Lobelia Lake,
W73-12379 5C

CORNELL, HOWLAND, HAYES AND MERRYFIELD, CORVALLIS, OREG.
Tertiary Treatment of Combined Domestic and Industrial Wastes,
W73-12512 5D

CORNELL UNIV., ITHACA, N.Y. DEPT. OF ENVIRONMENTAL ENGINEERING.
Annual Literature Review: Administration, Systems Analysis,
W73-12840 5G

CORNELL UNIV., ITHACA, N.Y. SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Finite Element Shallow Lake Circulation Analysis,
W73-12413 2H

CROWN ZELLERBACH CORP. CAMAS, WASH. ENVIRONMENTAL SERVICES DIV.
Methods for Pulp and Paper Mill Sludge Utilization and Disposal,
W73-12519 5E

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA). TRACE ANALYSIS RESEARCH CENTRE.
pH-Sensitive Fluorogenic Spray Reagents: II. Quantitative Studies with Pesticides,
W73-12727 5A

DELAWARE GEOLOGICAL SURVEY, NEWARK.
Geohydrology of the Dover Area, Delaware,
W73-12425 7C

DELAWARE UNIV., NEWARK. COLL. OF MARINE STUDIES.
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W73-12739 2L

DELAWARE UNIV., NEWARK. DEPT. OF GEOLOGY.
Trace Metal Baseline Studies on the Murderkill and St Jones Rivers, Delaware Coastal Plain,
W73-12959 5B

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Simultaneous Detection of the Residues of Atrazine and Linuron in Water, Soil, Plant, and Animal Samples by Thin-layer Chromatography,
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Water Relations of Plants in Raised Sphagnum Peat Bogs,
W73-12838 2I

DEPARTMENT OF AGRICULTURE, SWIFT CURRENT (SASKATCHEWAN). RESEARCH STATION.
Mayak, Russian Wild Ryegrass,
W73-12974 4A

DEPARTMENT OF AGRICULTURE, WELLINGTON (NEW ZEALAND). WALLACEVILLE ANIMAL RESEARCH CENTER.
DDT in Some New Zealand Marine and Freshwater Fauna,
W73-12925 5A

DEPARTMENT OF FISHERIES AND FORESTRY, OTTAWA (ONTARIO).
A Symposium on the Preservation and Multiple-Use Problems in the Great Lakes,
W73-12962 5C

DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT, OTTAWA (ONTARIO). NATIONAL AND HISTORIC PARKS BRANCH.
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W73-12688 6B

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, TAITA (NEW ZEALAND). SOIL BUREAU.
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W73-12928 5C

DIACHISHN (A.) AND ASSOCIATES, NEW YORK.
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W73-12366 5D

DOANE COLL., CRETE, NEBR.
Measuring and Developing Methods of Attitude and Motivational Change in Implementing the Big Blue River Basin Water Plan,
W73-12491 6B

DOW CHEMICAL CO., MIDLAND, MICH. ENVIRONMENTAL RESEARCH LAB.
Recondition and Reuse of Organically Contaminated Waste Sodium Chloride Brines,
W73-12521 5D

DUNDEE UNIV. (SCOTLAND). DEPT. OF BIOLOGICAL SCIENCES.
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W73-12977 3F

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W73-12855 5C

EAST AFRICAN FRESHWATER FISHERIES RESEARCH ORGANIZATION, JINJA (UGANDA).
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W73-12641 2H

EDISON WATER QUALITY RESEARCH LAB., N.J.
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W73-12626 5C

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W73-12601 5A

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W73-12376 5C

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A Cage for Exposing Aquatic Animals to Bottom Sediments,
W73-12372 2L

ENVIRONMENTAL PROTECTION AGENCY, PHOENIX, ARIZ. COLORADO RIVER BASIN WATER QUALITY CONTROL PROJECT.
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W73-12715 5B

ENVIRONMENTAL PROTECTION AGENCY, SAN FRANCISCO, CALIF. WATER QUALITY OFFICE.
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W73-12400 5C

PCBs and DDT,
W73-12402 5C

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.
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W73-12752 5G

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. (ASSIGNEE)
Waste Water Purification by Breakpoint Chlorination and Carbon Adsorption,
W73-12459 5D

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. DIV. OF WATER SUPPLY.
Pitless Units and Adapters,
W73-12776 8G

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF RESEARCH AND MONITORING.
Water Pollution Potential of Manufactured Products--Catalog Section I,
W73-12671-1 5G

Water Pollution Potential of Manufactured Products--Catalog Section II, Product Listing,
W73-12671-2 5G

Water Pollution Potential of Manufactured Products--Catalog Section III, Chemical Ingredient Listing,
W73-12671-3 5G

ERNST AND ERNST, WASHINGTON, D.C.
A Descriptive Analysis of the Bakery Products Industry Detailing Industry Trends and Characteristics Relevant to Economic Impact Analysis of Environmental Standards. Part II.
W73-12709 5G

A Study of the Impact of Pollution Standards and Charges on the Bakery Industry. Part III.
W73-12710 5G

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W73-12364 5G

FAR SEAS FISHERIES RESEARCH LAB., SHIMIZU (JAPAN).
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W73-12375 2L

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W73-12598 5G

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W73-12934 2H

FISHERIES RESEARCH BOARD OF CANADA, HALIFAX (NOVA SCOTIA). HALIFAX LAB.
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W73-12849 5A

Mercury in Canadian Fish,
W73-12970 5C

FISHERIES RESEARCH BOARD OF CANADA, NANAIMO (BRITISH COLUMBIA). BIOLOGICAL STATION.
Preliminary Study of Sablefish Culture, A Potential New Industry,
W73-12373 8I

The Effects of Sublethal Concentrations of Whole Bleached Kraftmill Effluent on the Growth and Food Conversion Efficiency of Underyearling Sockeye Salmon (Oncorhynchus nerka),
W73-12913 5C

FISHERIES RESEARCH BOARD OF CANADA, ST. ANDREWS (NEW BRUNSWICK). BIOLOGICAL STATION.
Biology of Rock Crab (Cancer Irroratus) in Northumberland Strait,
W73-12390 2L

Swimming Performance of Young Atlantic Salmon (Salmo salar) as Affected by Reduced Ambient Oxygen Concentration,
W73-12897 5C

FISHERIES RESEARCH BOARD OF CANADA, WINNIPEG (MANITOBA). FRESHWATER INST.
Crustacean Plankton and the Eutrophication of Lakes in the Okanagan Valley, British Columbia,
W73-12624 5C

Uptake of Mercury by Caged Rainbow Trout (Salmo Gairdneri) in the South Saskatchewan River,
W73-12857 5C

Design of Trapnet with Interchangeable Parts for the Capture of Large and Small Fishes from Varying Depths,
W73-12899 8I

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, BANGKOK (THAILAND). SOIL SURVEY LAND CLASSIFICATION PROJECT.
Morphology, Genesis, Occurrence and Agricultural Potential of Acid Sulphate Soils in Central Thailand,
W73-12818 2G

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The African Great Lakes Fisheries: Past, Present and Future,
W73-12646 8I

Exploratory Bottom Trawling in Lake Victoria,
W73-12803 2H

FOREST SERVICE (USDA), ALBUQUERQUE, N. MEX. ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION.
The Visual Aspects of Resource Management,
W73-12407 4D

FOREST SERVICE (USDA), FLAGSTAFF, ARIZ. ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION.
A Treatment Prescription for Improving Big Game Habitat in Ponderosa Pine Forests,
W73-12406 4D

FOREST SERVICE (USDA), FORT COLLINS, COLO. ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION.
Theory of Precipitation Effects on Dead Cylindrical Fuels,
W73-12381 2B

FOREST SERVICE (USDA), OGDEN, UTAH. INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION.
Effects of Air Gaps and Saturated Voids on Accuracy of Neutron Moisture Measurements,
W73-12636 2G

FOREST SERVICE (USDA), RESEARCH TRIANGLE PARK, N.C. FOREST SCIENCE LAB.
Investigation of Mineral Nutrient Cycling in Upland Piedmont Forest,
W73-12700 4A

FOREST SERVICE (USDA), RHINELANDER, WIS. NORTH CENTRAL FOREST EXPERIMENT STATION.
Effects of Aeration, Water Supply, and Nitrogen Source on Growth and Development of Tupelo Gum and Bald Cypress,
W73-12923 2I

FOREST SERVICE (USDA), TEMPE, ARIZ. FOREST HYDROLOGY LAB.
Wildlife Habitat Improvement in Relation to Watershed Management in the Southwest,
W73-12404 4D

FOREST SERVICE (USDA), TUCSON, ARIZ. ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION.
Measuring Public Responses to Vegetative Management,
W73-12408 4D

Valuation of Timber, Forage and Water from National Forest Lands,
W73-12701 6B

FORT WAYNE WATER POLLUTION CONTROL PLANT, IND.
Phosphorus Removal and Plant Operation Studies at Fort Wayne, Indiana,
W73-12500 5D

FRESHWATER BIOLOGICAL ASSOCIATION, WAREHAM (ENGLAND). RIVER LAB.
The Growth, Reproduction and Food of the Roach Rutilus rutilus (L.), of the River Lugg, Herefordshire,
W73-12921 8I

GENERAL ELECTRIC CO., PITTSFIELD, MASS. (ASSIGNEE)
Method of Reducing Phenolic Waste,
W73-12447 5D

GEOLOGICAL SURVEY, ANCHORAGE, ALASKA.
Channel Erosion Surveys Along Proposed Taps Route, Alaska, July 1971,
W73-12957 2J

GEOLOGICAL SURVEY, ARLINGTON, VA.
Buffalo Creek Dam Disaster: Why It Happened,
W73-12411 4C

GEOLOGICAL SURVEY, ATLANTA, GA.
Preliminary Flood-Frequency Relations for Small Streams in Georgia,
W73-12946 4A

GEOLOGICAL SURVEY, BAY ST. LOUIS, MISS. GULF COAST HYDROSCIENCE CENTER.
Hydraulics of Sheetlike Solution Cavities,
W73-12944 4B

GEOLOGICAL SURVEY, BERKELEY, CALIF.
River Channel Change With Time: An Example,
W73-12590 2J

GEOLOGICAL SURVEY, DENVER, COLO. WATER RESOURCES DIV.
Publications of Water Resources Investigations in Colorado and Selected Publications Pertaining to Colorado.
W73-12954 2A

GEOLOGICAL SURVEY, GRAND FORKS, N. DAK.
Ground-Water Resources, Nelson and Walsh Counties, North Dakota,
W73-12578 2F

Geology of Nelson and Walsh Counties, North Dakota,
W73-12579 2F

GEOLOGICAL SURVEY, HARTFORD, CONN.
A Proposed Streamflow Data Program for Connecticut,
W73-12748 4A

GEOLOGICAL SURVEY, IDAHO FALLS, IDAHO. WATER RESOURCES DIV.
Stage-Discharge Relations on Big Lost River Within National Reactor Testing Station, Idaho,
W73-12750 4A

GEOLOGICAL SURVEY, LAKEWOOD, COLO.
Radiochemical Monitoring of Water After the Cannikin Event, Amchitka Island, Alaska, October, 1972,
W73-12945 5B

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
Sources of Data for Evaluation of Selected Geothermal Areas in Northern and Central Nevada,
W73-12947 4B

Reports for California by the Geological Survey Water Resources Division.
W73-12953 2A

GEOLOGICAL SURVEY, MENLO PARK, CALIF. WATER RESOURCES DIV.
Selected Data on Wells in the Barstow Area, Mojave River Basin, California,
W73-12421 4B

Water Quality in the Middle Fork Feather River, California, May 1970 Through September 1971,
W73-12720 5A

GEOLOGICAL SURVEY, RALEIGH, N.C.
Sediment Resulting From Construction of an Interstate Highway in the Piedmont Area of North Carolina,
W73-12713 4C

GEOLOGICAL SURVEY, RENO, NEV.
Evaluation of the Water Resources of Lemmon Valley, Washoe County, Nevada, With Emphasis on Effects of Ground-Water Development to 1971,
W73-12718 4B

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.
Hydrologic Records for Lake County, Florida: 1971-72,
W73-12949 2E

GEOLOGICAL SURVEY, UNIVERSITY, ALA.
Elements of the Water Resources Situation in Alabama,
W73-12749 6B

GEOLOGICAL SURVEY, WASHINGTON, D.C.
Hydrogeology of the Carbonate Rocks, Frederick and Hagerstown Valleys, Maryland,
W73-12719 4B

Water Levels Near a Well Discharging From an Unconfined Aquifer,
W73-12777 4B

GEORGETOWN UNIV., WASHINGTON, D.C. DEPT. OF BIOLOGY.
A Study of Inorganic Salts Requirements and Effect on the Morphology of Marine Bacteria,
W73-12628 5C

GEORGIA UNIV., ATHENS. COLL. OF VETERINARY MEDICINE.
Aeromonas-Induced Deaths Among Fish and Reptiles in an Eutrophic Inland Lake,
W73-12633 5C

GEORGIA UNIV., ATHENS. DEPT. OF ENTOMOLOGY.
The Benthic Fauna in Four Small Southern Appalachian Streams,
W73-12784 2I

GEORGIA UNIV., ATHENS. SCHOOL OF FOREST RESOURCES.
The Seasonal Abundance of the Ancyrocephalinae (Monogenea) on Largemouth Bass in Walter F. George Reservoir,
W73-12978 2H

GLOWNY INSTYTUT GORNICTWA, KATOWICE (POLAND).
Possibilities of Water Treatment by Means of a Magnetic Field,
W73-12481 5D

GOLDER, BRAWNER AND ASSOCIATES LTD., VANCOUVER (BRITISH COLUMBIA).
Evaluation of Hydraulic Properties of Rock Masses Influenced by Major Heterogeneities,
W73-12468 8E

GOSUDARSTVENNI GIDROLOGICHESKII INSTITUT, LENINGRAD (USSR).
Results of a Study of Water Regime of Soils on Small Watersheds in the Don River Basin (Rezul'taty izucheniya vodnogo rezhima pochv malykh vodosborov v basseyne r. Dona),
W73-12441 2G

GOSUDARSTVENNYI GIDROLOGICHESKII INSTITUT, LENINGRAD (USSR).
Problems in the Production of a Spring Flood (Voprosy formirovaniya vesennego polovod'ya).
W73-12435 4A

Investigation of Thermal Properties of Soils in the Don River Basin for Estimation of Snowmelt Losses to Infiltration Into Frozen Soil (Issledovaniye teplovykh svoystv pochv basseyna r. Dona dlya otsenki poter' talykh vod na in fil'tratsiyu v merzluyu pochvu),
W73-12436 2G

Laboratory Investigations of the Transmission Capacity of Frozen and Thawed Soils Based on

Data of the Valday Field Laboratory (Vnigl) (Laboratornyye issledovaniya vodopropusknoy sposobnosti merzlykh i talykh pochvo-gruntov (po materialam merzlothoy laboratorii VNIGL)),
W73-12437 2G

Principles for Estimating and Forecasting Water Losses in Spring on Watersheds in Northwestern European USSR (Printsipy otsenki i prognoza poter' vesennikh vod na vodosborakh Severo-Zapada YeTS),
W73-12438 2G

Estimation and Forecast of Water Losses During a Spring Flood to Groundwater Recharge for Watersheds in Northwestern European USSR Based on Data of the Valday Field Laboratory (Otsenka i prognoz poter' vody v period vesenne go polovod'ya na popolneniye zapasov gruntovykh vod dlya vodosborov Severo-Zapada YeTS (po materialam VNIGL)),
W73-12439 2F

Factors Producing the Outstanding Spring Flood of 1970 in Upper Don River Basins (Usloviya formirovaniya vydayushchegosya vesennego polovod'ya 1970 g. v basseynakh rek verkhnego Dona),
W73-12440 2E

Evaporation During a Flood Period Caused by Spring Snowmelt (Ispareniye v period vesennego snegotayaniya i polovod'ya),
W73-12442 2D

Some Hydrophysical Characteristics of Soils in the Don River Basin to Kazanskaya Station (Nekotoryye vodno-fizicheskiye kharakteristiki pochv basseyna r. Dona do st-tsy Kazanskoy),
W73-12443 2G

Methods of Determining Soil Moisture Storage in Winter (K metodike opredeleniya vlagozapasov pochvy v zimniy period goda),
W73-12444 2G

GOVERNMENT COLL. OF ENGINEERING, AURANGABAD (INDIA).
Cost Curves for Cross-Drainage Works,
W73-12704 4A

GREAT LAKES BASIN COMMISSION, ANN ARBOR, MICH.
The Planning Viewpoint,
W73-12964 6B

GRUMMAN AEROSPACE CORP., BETHPAGE, N.Y. RESEARCH DEPT.
Water Quality Determinations in the Virgin Islands from ERTS-A Data,
W73-12630 5A

GRUMMAN AEROSPACE CORP., MORICHES, N.Y.
Boost A/D Rates with Staggered Operation,
W73-12893 7C

GUELPH UNIV. (ONTARIO). DEPT. OF BOTANY.
Hydrostatic Pressure in Relation to the Synchronous Culture of Algae in Open and Closed Systems,
W73-12798 5C

GUELPH UNIV. (ONTARIO). DEPT. OF LAND RESOURCE SCIENCE.
Land Disposal of Liquid Sewage Sludge: I. The Effect on Yield, in Vivo Digestibility, and Chemical Composition of Coastal Bermudagrass (Cynodon dactylon L. Pers.),
W73-12914 5D

HALLIBURTON SERVICES, TULSA, OKLA.
Here's a New Sand Pack Method,
W73-12761 8G

HANDELSHOGSKOLAN I STOCKHOLM (SWEDEN).
Peter Bohm.
W73-12680 6B

HARVARD MEDICAL SCHOOL, BOSTON, MASS.
The Role of Heavy Metals in Biology,
W73-12613 5C

HARVARD UNIV., CAMBRIDGE, MASS. DEPT. OF CHEMISTRY.
Lipids in Shallow Bottom Sediments,
W73-12717 5B

HARYANA AGRICULTURAL UNIV., HISSAR (INDIA).
Cenchrus Ciliaris--A Perennial Pasture Grass of Arid and Semi-Arid Areas,
W73-12790 4A

HAWAII AGRICULTURAL EXPERIMENT STATION, HONOLULU.
Effect of Environmental Factors on Water Utilization and Boron Accumulation and Translocation in Sugarcane,
W73-12966 3F

HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER.
Tritium Measurement of Natural Waters on Oahu, Hawaii: A Preliminary Interpretation (Sampling Period: July 1969 to June 1970),
W73-12499 5A

HEBREW UNIV., JERUSALEM (ISRAEL). DEPT. OF BOTANY.
Delayed Seed Dispersal and Rapid Germination as Survival Mechanisms of the Desert Plant Blepharis Persica (Burm.) Kuntze,
W73-12787 2I

HEBREW UNIV., REHOVOT (ISRAEL). DEPT. OF SOIL SCIENCE.
The Effect of Soil Temperature on Plants Grown in Saline Soil,
W73-12797 2G

HIROSHIMA UNIV. (JAPAN). FACULTY OF FISHERIES AND ANIMAL HUSBANDRY.
Salmonella Contamination of Rivers and Sewages in Fukuyama City, (In Japanese),
W73-12648 5C

HOLMES AND NARVER, INC., ANAHEIM, CALIF.
California Power Plant Siting Study: Volumes, I, II, and III.
W73-12574 5G

HONG KONG UNIV.
Electrostatic Crop Spraying,
W73-12482 3F

HULL UNIV. (ENGLAND).
Observations of Tufa Deposition,
W73-12730 2K

HYDRAULIC RESEARCH INST., PRAGUE (CZECHOSLOVAKIA). SURFACE WATER QUALITY DIV.
The Effect of Longitudinal Dispersion on the Deoxygenation Rate in Polluted Streams,
W73-12714 5B

HYDRO-ELECTRIC COMMISSION, TASMANIA.
Turbine Design and Performance for the Mersey-Forth Hydro Power Development,
W73-12486 8C

HYDROCOMP, INC., PALO ALTO, CALIF.
Critical Review of Currently Available Water Quality Models,
W73-12352 6A

HYDROSCIENCE, INC., WESTWOOD, N.J.
Mathematical modeling of Phytoplankton Populations,
W73-12399 5C

IDAHO COOPERATIVE FISHERY UNIT, MOSCOW.
Effects of Zectran Insecticide on Aquatic Organisms in Bear Valley Creek, Idaho,
W73-12634 5C

IFE UNIV. (NIGERIA). DEPT. OF AGRICULTURAL ENGINEERING.
Analysis of Seepage Into Ground-Water System,
W73-12412 4B

IIT RESEARCH INST., CHICAGO, ILL.
Lithium Silicate Sedimentation Tracer for Shoal Deposit Studies,
W73-12862 5B

ILLINOIS STATE WATER SURVEY, URBANA.
Disinfection of Sewage Effluents,
W73-12504 5D

ILLINOIS UNIV., CHICAGO. COLL. OF DENTISTRY.
Impact of Water Fluoridation on Dental Practice and Dental Manpower,
W73-12816 5F

IMPERIAL COLL. OF SCIENCE AND TECHNOLOGY, LONDON (ENGLAND). DEPT. OF CHEMISTRY.
Effect of Level of Soil Moisture on Nitrogen Mineralization and Nitrification During Incubation of East Pakistan Tea Soils,
W73-12799 3F

INDIAN AGRICULTURAL RESEARCH INST., NEW DELHI.
Influence of Moisture Regime on the Genesis of Laterite Soils in South Inida: II. Clay Composition and Mineralogy,
W73-12721 2G

INDIAN AGRICULTURAL RESEARCH INST., NEW DELHI. DIV. OF BIOCHEMISTRY.
Effect of Varying Water Management Practices on the Growth, Yield and Nitrogen Uptake by High-Yielding Rice Varieties,
W73-12583 3F

INDIAN AGRICULTURAL RESEARCH INST., NEW DELHI. DIV. OF SOIL SCIENCE AND AGRICULTURAL CHEMISTRY.
Erodibility of Hill Soils of Sutlej Catchment Area in Himachal Pradesh,
W73-12635 2J

INDIAN GRASSLAND AND FODDER RESEARCH INST., JHANSI. DIV. OF WEED ECOLOGY CONTROL.
Evaluation of Herbicides for Submerged Weeds in Chambal and Bhakra-Nangal Canal Systems,
W73-12738 5G

INDIAN INST. OF SCIENCE, BANGALORE. DEPT. OF BIOCHEMISTRY.
Significance of Heating Agricultural Soils,
W73-12802 3F

INDIAN VETERINARY RESEARCH INST., IZATNAGAR.
Concentration of Fluorine in Potable Water in Bihar Plateau: A Preliminary Survey,
W73-12645 5A

INDIANA STATE UNIV., TERRE HAUTE. DEPT. OF GEOGRAPHY AND GEOLOGY.
Salt Pollution of a Shallow Aquifer--Indianapolis, Indiana,
W73-12940 5B

INDIANA UNIV., BLOOMINGTON. DEPT. OF GEOGRAPHY.
Horton's 1945 Study: A Cartobibliography,
W73-12596 7C

INDIANA UNIV. OF PENNSYLVANIA. DEPT. OF CHEMISTRY.
Simultaneous Polarographic Determination of Iron (II) and Iron (III) in Coal Mine Waste Water,
W73-12976 5A

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Thorium in Water and Algae from the Adriatic Sea,
W73-12927 5A

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W73-12746 2K

INSTITUTE OF PAPER CHEMISTRY, APPLETON, WIS.
Water Pollution in the Pulp and Paper Industry. I. General and In-Plant Modifications,
W73-12553 5D

Water Pollution in the Pulp and Paper Industry. II. Testing Methods,
W73-12554 5A

Water Pollution in the Pulp and Paper Industry. III. Stream Response,
W73-12555 5C

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. A. Physical Operations,
W73-12556 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. B. Biological Systems,
W73-12557 5D

Water Pollution in the Pulp and Paper Industry. IV. Treatment Methods. C. Chemical Processes, General Observations, and Reports,
W73-12558 5D

INSTITUTE OF PUBLIC UTILITY SERVICES, WARSAW (POLAND).
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W73-12703 6C

INSTYTUT CELULOZOWO-PAPIERNICZY, WARSAW (POLAND).
Practical Decolorization of Kraft Mill Effluents (Praktyka usuwania barwy sciekow posiarczanowych),
W73-12544 5D

INTER-COMPUTER ELECTRONICS, INC., LANSDALE, PA.
High Speed A-D Converters in a Memory Test System,
W73-12891 7C

INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION, NEW WESTMINISTER (BRITISH COLUMBIA).
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W73-12529 5D

IOWA STATE UNIV., AMES. DEPT. OF AGRONOMY.
Determination of Ammonium in Soil Extracts and Water Samples by an Ammonia Electrode,
W73-12939 2G

IOWA STATE UNIV., AMES. DEPT. OF ECONOMICS.
Economics in Soil and Water Conservation,
W73-12691 3F

Identification and Achievement of Environmental Quality Levels in Managing the Use of Natural Resources,
W73-12696 5G

Public Land Use Policy: Needs, Objectives, and Guidelines,
W73-12697 4A

IRAPA, PRAGUE (CZECHOSLOVAKIA).
Determination of Organic Substances in Industrial Effluents (Nektere moznosti stanoveni organickeho znecisteni odpadnich vod),
W73-12532 5A

JAWAHARLAL NEHRU AGRICULTURAL UNIV., JABALPUR (INDIA).
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W73-12539 3F

Effect of Compaction on Yield and Uptake of N, P and K by Maize (Zea mays L.),
W73-12660 3F

JOHNS HOPKINS UNIV., BALTIMORE, MD. CHESAPEAKE BAY INST.
Observations of Intermediate and Small Scale Turbulent Water Motion in a Stratified Estuary (Parts I and II),
W73-12424 2L

JUTE AGRICULTURAL RESEARCH INST., BARRACKPORE (INDIA).
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W73-12831 3F

KAGAWA UNIV., TAKAMATSU (JAPAN). DEPT. OF AGRICULTURAL ENGINEERING.
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W73-12639 5C

KANSAS STATE UNIV., MANHATTAN. DEPT. OF CHEMICAL ENGINEERING.
ATP Pools in Pure and Mixed Cultures,
W73-12887 5A

KEENE CORP., AURORA, ILL. WATER POLLUTION CONTROL DIV.
Selecting Waste Water Aeration Equipment,
W73-12534 5D

KIMBERLY-CLARK CORP., NEENAH, WIS. (ASSIGNEE)
Waste Treatment System,
W73-12461 5D

KOBE UNIV. (JAPAN). FACULTY OF AGRICULTURE.
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W73-12996 5B

KRYMSKII SELSKOKHOZYAISTVENNYI INSTITUT, SIMFEROPOL (USSR).
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W73-12744 2G

LAHMEYER INTERNATIONAL G.M.B.H., FRANKFURT AM MAIN (WEST GERMANY).
Hydrological Reservoir Design Using Basic Systems Theory Techniques,
W73-12471 8A

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W73-12936 5B

LBC AND W ASSOCIATES, COLUMBIA, S.C.
Functional Water and Sewerage Plan and Program, Pee Dee Region, South Carolina.
W73-12365 5G

LEEDS UNIV. (ENGLAND). DEPT. OF PLANT SCIENCES.
Correlated Light and Electron Microscope Studies on Brown Algae. II. Physode Production in Dictyota,
W73-12388 5C

LEICESTER UNIV. (ENGLAND). DEPT. OF ZOOLOGY.
Physiological Changes in Mytilus Edulis L. Induced by Temperature and Nutritive Stress,
W73-12878 5C

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Optimum Conditions for the Discharge of Paper Industry Effluents (Optimal'noe vodootvedenie stokov bumazhnogo proizvodstva),
W73-12547 5G

LENZINGER ZELLULOSE- UND PAPIERFABRIK A.G. (AUSTRIA).
Methods for the Further Improvement of Spent Liquor Recovery in Lenzing,
W73-12524 5D

LIVERPOOL UNIV. (ENGLAND). DEPT. OF BOTANY.
Characterization of Exudation from Excised Roots of Onion, Allium Cepa: I. Water Flux,
W73-12989 3F

LIVERPOOL UNIV. (ENGLAND). DEPT. OF ZOOLOGY.
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W73-12823 2I

LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE (ENGLAND).
Extinction of a Fishery by Commercial Exploitation: A Note,
W73-12692 6B

LONDON UNIV., (ENGLAND). DEPT. OF ECONOMICS.
Some Limitations of Benefit-Cost Analysis in Respect of Programmes with Environmental Consequences,
W73-12682 6B

LONG ISLAND UNIV., GREENVALE, N.Y. SCIENCE ENGINEERING RESEARCH GROUP.
An Interdisciplinary Study of the Estuarine and Coastal Oceanography of Block Island Sound and Adjacent New York Coastal Waters,
W73-12629 5A

LOS ALAMOS SCIENTIFIC LAB., N. MEX.
Sensitivity and Detectability Limits for Elemental Analysis by Proton-Induced X-Ray Fluorescence with a 3 Mv Van de Graaff,
W73-12935 5A

LOUISIANA STATE UNIV., BATON ROUGE. COASTAL STUDIES INST.
Process-Form Variability of Multiclass Coasts: Baja California,
W73-12422 2L

Heat and Water Balance Studies on Grand Cayman,
W73-12822 2D

LOUISIANA STATE UNIV., BATON ROUGE. DEPT. OF AGRONOMY.
Nitrogen Loss from Flooded Soil,
W73-12967 2G

LULEJIAN AND ASSOCIATES, INC., FALLS CHURCH, VA.
Survey of Water Transportation Potential to Reduce Congestion and Pollution in Washington, D.C. and Other Major Cities.
W73-12363 5G

MACMILLAN BLOEDEL LTD., VANCOUVER (BRITISH COLUMBIA).
Pitfalls and Procedures in BOD Tests,
W73-12527 5A

MAINE UNIV., ORONO. DEPT. OF ZOOLOGY.
A Simple Method for Recording Fish Heart and Operculum Beats Without the Use of Implanted Electrodes,
W73-12858 7B

MAINE UNIV., WALPOLE. IRA C. DARLING CENTER FOR RESEARCH, TEACHING AND SERVICE.
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W73-12740 2L

MAKERERE UNIV., KAMPALA (UGANDA).
The Superimposition Hypothesis for Incised Meanders--A General Rejecton and Specific Test,
W73-12736 2E

MALAYA UNIV., KUALA LUMPUR (MALAYSIA).
Some Examples of Drainage Component Analysis,
W73-12734 4A

MANCHESTER UNIV. (ENGLAND).
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W73-12731 2J

MANITOBA UNIV., WINNIPEG. DEPT. OF BOTANY.
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W73-12903 5C

MANITOBA UNIV., WINNIPEG. DEPT. OF CHEMISTRY.
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W73-12868 5A

MANITOBA UNIV., WINNIPEG. DEPT. OF SOIL SCIENCE.
Germination of Wheat as Affected by Soil Water Stress,
W73-12884 3F

MANITOBA UNIV., WINNIPEG. DEPT. OF ZOOLOGY.
A Comparison of Liquid Scintillation and Geiger-Muller Estimates of Primary Productivity in an in Situ Experiment,
W73-12848 5A

MARYLAND UNIV., COLLEGE PARK. COLL. OF BUSINESS AND PUBLIC ADMINISTRATION.
The Role of Uniform Standards in International Environmental Management.
W73-12686 6B

MARYLAND UNIV., SOLOMONS. NATURAL RESOURCES INST.
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W73-12880 5A

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF CIVIL ENGINEERING.
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W73-12728 2L

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. HYDRODYNAMICS LAB.
The Computation of Tides and Currents in Estuaries and Canals,
W73-12428 2L

MASSACHUSETTS UNIV., AMHERST. COASTAL RESEARCH CENTER.
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W73-12423 2C

MASSEY UNIV., PALMERSTON NORTH (NEW ZEALAND).
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W73-12917 5C

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W73-12666 2I

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Preparation and Properties of 3-Trifluoromethyl-4-Aminophenol,
W73-12622 5B

MELBOURNE UNIV., PARKVILLE (AUSTRALIA). DEPT. OF AGRICULTURAL ENGINEERING.
The Effect of Irrigation Depth on Root Growth of Some Pasture Species,
W73-12834 3F

MICHIGAN DPT. OF PUBLIC HEALTH, LANSING. BUREAU OF ENVIRONMENTAL HEALTH.
Poliovirus in a Water Supply,
W73-12922 5B

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W73-12963 6B

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF ENTOMOLOGY.
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W73-12804 5B

MICHIGAN STATE UNIV., HICKORY CORNERS. W. K. KELLOGG BIOLOGICAL STATION.
Energetics of Natural Populations of Freshwater Macroconsumers,
W73-12374 5C

The Utilization of Leaf Litter by Stream Detritivores,
W73-12882 5C

Sugar-Coated Daphnia: A Preservation Technique for Cladocera,
W73-12910 5A

MICHIGAN UNIV., ANN ARBOR. DEPT. OF CHEMICAL ENGINEERING.
Electrical Stimulation of Microbial Waste Treatment,
W73-12503 5D

MICHIGAN UNIV., ANN ARBOR. GREAT LAKES RESEARCH DIV.
Nutrient Enrichment and Eutrophication of Lake Michigan,
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MIDWEST RESEARCH INST. KANSAS CITY, MO.
Degradation of Methylmercury by Bacteria Isolated from Environmental Samples,
W73-12620 5A

An Immobilized Cholinesterase Product for Use in the Rapid Detection of Enzyme Inhibitors in Air or Water,
W73-12901 5A

MINGES (JAMES S.) AND ASSOCIATES, INC., FARMINGTON, CONN.
Regional Utilities Study: Drainage Volume of Technical Appendix.
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Measurement of Currents in the Great Lakes,
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MINNESOTA MINING AND MFG. CO., ST. PAUL.
Encourage Applied Research and Publish the Findings,
W73-12758 5G

MINNESOTA UNIV., ST. PAUL. COLL. OF FORESTRY.
Water Potential in Red Pine: Soil Moisture, Evapotranspiration, Crown Position,
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MINNESOTA UNIV., ST. PAUL. DEPT. OF ENTOMOLOGY, FISHERIES AND WILDLIFE.
Annual Production of a Stream Mayfly Population: A Comparison of Methods,
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Studies on Helminths of North Dakota: IV. Parasites of the River Carpsucker, Carpiodes carpio, with Descriptions of Three New Species (Monogenea),
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MISSISSIPPI STATE UNIV., STATE COLLEGE. DEPT. OF CIVIL ENGINEERING.
Wastewater Treatment Design Related to Biological Growth Supported by Activated Carbon,
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MISSISSIPPI STATE UNIV., STATE COLLEGE. SOCIAL SCIENCE RESEARCH CENTER.
A Study of Selected Aspects of Rural Water System Development in Mississippi,
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MISSISSIPPI UNIV., UNIVERSITY. BUREAU OF BUSINESS AND ECONOMIC RESEARCH.
The Effect of Price and Other Selected Variables on Water Consumption,
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Characterization of Chemical Sludges,
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MISSOURI UNIV., COLUMBIA. DIV. OF BIOLOGICAL SCIENCES.
Bacterial Degradation of Detergent Compounds,
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A Suggested New Approach to the Analysis of Drainage Basin Shapes,
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MONSANTO BIODIZE SYSTEMS, INC., GREAT NECK, N.Y.
Waste Disposal Well Performance,
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Ion Exchange Color and Mineral Removal from Kraft Bleach Wastes,
W73-12522 5D

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Demostration of a Waste Disposal System for Livestock Waste,
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Water Content in Convective Storm Clouds,
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Health Standards for Metals in Drinking Water,
W73-12610 5G

An Improved Method For Determining Organics by Activated Carbon Adsorption and Solvent Extraction - Pt. II (Test Method),
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Carbon Cycle in Sediment-Water Systems,
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Effect of Heavy Metals on Fish,
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Evaluation of ERTS Data for Certain Oceanographic Uses,
W73-12429 7B

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Selectivity of Towed-Net Samplers,
W73-12669 7B

NATIONAL MARINE FISHERIES SERVICE, MIAMI, FLA. SOUTHEAST FISHERIES CENTER.
Contributions to the Life History of the Piute Sculpin in Sagehen Creek, California,
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Green Snow and Ice From the Antarctica,
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Environmental Care at Pulp Mills, Results and Expectations,
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Stress Distribution Around a Tunnel Situated in a Layer Under the Action of Gravity,
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Some Short-Term Indicators of Sublethal Effects of Copper on Brook Trout, Salvelinus Fontinalis,
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Climatology of Rainfall Probabilities for Oahu, Hawaii,
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NAVAL RESEARCH LAB., WASHINGTON, D.C.
Corrosion of Metals in Tropical Waters---Structural Ferrous Metals,
W73-12772 8G

NAVAL WEAPONS CENTER, CHINA LAKE, CALIF. MICHELSON LABS.
Selective Substrate Utilization by Marine Hydrocarbonoclastic Bacteria,
W73-12621 5B

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Nutrients in Nebraska's Waters,
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Hydrologic Models for Poorly Defined Drainage Areas,
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NEW BRUNSWICK UNIV., FREDERICTON. NORTHEASTERN WILDLIFE STATION.
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W73-12805 3F

Evaluation of Tensiometers for Estimating Plant Water Stress in Citrus,
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Mariculture in Estuarine Oil-Pipeline Canals in Louisiana,
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Standing Crops of Natural Fish Populations in Brackish-Water Oil Field Pipeline Canals,
W73-12952 5C

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Characterization of Sweet Potato Processing Wastes,
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Trisodium Nitrilotriacetate in Drinking Water: Metabolic and Renal Effects in Rats,
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A Hydrographic Atlas of Larger North Carolina Sounds,
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NORTH DAKOTA STATE UNIV., FARGO. DEPT. OF ENTOMOLOGY.
Edaphic and Water Relationships of Aldicarb and its Metabolites,
W73-12979 2G

NORTH DAKOTA STATE UNIV., FARGO. DEPT. OF ZOOLOGY.
Benthic Invertebrates in Lake Ashtabula Reservoir, North Dakota,
W73-12863 5C

NORTH TEXAS STATE UNIV., DENTON. DEPT. OF BIOLOGICAL SCIENCES.
Some Effects of Evaporation Suppression on Reservoir Ecology,
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NORTHWESTERN UNIV., EVANSTON, ILL. DEPT. OF GEOLOGICAL SCIENCES.
Wind-Driven Model for Evaporite Deposition in a Layered Sea,
W73-12594 2J

OAK RIDGE NATIONAL LAB., TENN.
Flow of Microbially Fixed Nitrogen in a Model Ecosystem,
W73-12847 5B

OCEAN AND ATMOSPHERIC SCIENCE, INC., DOBBS FERRY, N.Y.
Environmental Impact Study.
W73-12580 5G

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Parasitism of Mosquitoes by Water Mites,
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OHIO STATE UNIV., COLUMBUS.
Identification of the Limiting Nutrient and Specific Growth Rate,
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An Approach to Hydrogeologic Investigations of River Alluvium by the Use of Computerized Data Processing Techniques,
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The Influence of Organic Drift on the Food Habits and Life History of the Yellowfin Shiner, Notropis Lutipinnis (Jordan and Brayton),
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Description and Ecology of Hyaiella Texana N. Sp. (Crustacea: Amphipoda) from the Edwards Plateau of Texas,
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OKLAHOMA UNIV., NORMAN. SCHOOL OF CIVIL ENGINEERING AND ENVIRONMENTAL SCIENCE.
Systems Approach to Metropolitan and Regional Area Water and Sewer Planning,
W73-12351 6A

ONTARIO WATER RESOURCES COMMISSION, TORONTO.
Lake Movements with Partial Ice Cover,
W73-12663 2H

OREGON COOPERATIVE FISHERY UNIT, CORVALLIS.
Effects of Metals on Fertilization and Development in Fish,
W73-12612 5C

OREGON STATE UNIV., CORVALLIS.
Water Resource Decison Making--How Effective is the Public Input,
W73-12693 6B

OREGON STATE UNIV., CORVALLIS. DEPT. OF AGRICULTURAL CHEMISTRY.
Environmental Contamination by Toxic Metals,
W73-12605 5B

Selenium in the Environment,
W73-12614 5C

OREGON STATE UNIV., CORVALLIS. DEPT. OF MECHANICAL AND NUCLEAR ENGINEERING.
Numerical Thermal Plume Model for Vertical Outfalls in Shallow Water,
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Arsenic and Cadmium in the Environment,
W73-12607 5C

OREGON STATE UNIV., CORVALLIS. SCHOOL OF OCEANOGRAPHY.
Computer Models of Delta Growth Due to Sediment Input From Rivers and Longshore Transport,
W73-12592 2J

Heavy Metals in Estuaries and the Coastal Zone,
W73-12606 5B

ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, PARIS (FRANCE).
Advanced Pollution Abatement Technology in the Pulp and Paper Industry.
W73-12552 5D

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Ecological Information on the Differences in the Number of Culex tritaeniorhynchus Larvae Among Paddy Fields (In Japanese),
W73-12829 3F

OSLO UNIV. (NORWAY). INST. OF ECONOMICS.
Outline of a Macro-Economic Analysis of Environmental Pollution: A Multi-Sectoral Approach,
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System for Removing Color From Paper Mill Liquid Waste,
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Experimental Investigation of Rock Weathering by Salts,
W73-12733 2K

PACIFIC GAS AND ELECTRIC EMERYVILL, CALIF. ENGINEERING RESEARCH DEPT.
Quantitative Sampling of Live Zooplankton With a Filter-Pump System,
W73-12911 5A

PACIFIC NORTHWEST ENVIRONMENTAL RESEARCH LAB., CORVALLIS, OREG.
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Comprehensive Public Water Supply Study for Schenectady County, New York.
W73-12358 3D

Summary Report: Comprehensive Sewerage Study for Schenectady County, New York.
W73-12359 5G

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New Applications of Geophysical Methods to Ground-Water Problems in Pennsylvania,
W73-12783 2F

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF AGRONOMY.
Growth and Chemical Composition of Eight Grasses Grown Under High Water Table Conditions,
W73-12972 2I

PERKIN-ELMER CORP., NORWALK, CONN.
An Improved AA Microsampling System,
W73-12865 5A

PETROLITE CORP. ST. LOUIS, MO. (ASSIGNEE)
Circular Flotation System,
W73-12457 5D

POLITECNICO DI MILANO (ITALY). ISTITUTO DI MECCANICA APPLICATA.
Energy Method for Computing the Amplitude of Vibration of Conductor Bundles Due to Wake Effect,
W73-12480 8C

POLYTECHNIC INST. OF BROOKLYN, N.Y. DEPT. OF SOCIAL SCIENCES.
Behavior of the Goldfish as an Early Warning System for the Presence of Pollutants in Water,
W73-12916 5A

PUBLIC HEALTH SERVICE, DALLAS, TEX. REGION VII.
Problems of Groundwater Pollution by Brine,
W73-12770 5B

PUNJAB AGRICULTURAL UNIV., LUDHIANA (INDIA). DEPT. OF SOILS.
Effects of Various Soil Moisture Regimes and Different Levels of Nitrogen and Different Spacings of the Quality of Potato Tubers (Solanum Tuberosum L.),
W73-12640 3F

PURDUE UNIV., LAFAYETTE, IND.
Real-Time Interactive Instrumentation,
W73-12850 7A

PURDUE UNIV., LAFAYETTE, IND. DEPT. OF AGRONOMY.
Annual Water Balance and Agricultural Development in Alaska,
W73-12664 3F

QUEEN ELIZABETH COLL., LONDON (ENGLAND). DEPT. OF BIOLOGY.
An Evaluation of Liquid Scintillation Counting Techniques for Use in Aquatic Primary Production Studies,
W73-12907 5A

QUEEN MARY COLL., LONDON (ENGLAND). DEPT. OF ECONOMICS.
Notes on Information and Administrative Costs in the Theory of Externalities,
W73-12678 6B

QUEENS COLL., FLUSHING, N.Y. DEPT. OF BIOLOGY.
Effect of Incubation Temperature on the Macromolecular and Lipid Content of the Phytoflagellate Ochromonas danica,
W73-12896 5C

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The Association of Amphipods in the Shallow-Water Sand Habitat of Strangford Lough, Co. Down,
W73-12879 5A

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W73-12890 5D

READING UNIV. (ENGLAND). DEPT. OF ZOOLOGY.
The Distribution of Stream-Dwelling Triclads (Platyhelminthes) in North Wales,
W73-12971 2I

REGIONAL PLANNING COUNCIL, BALTIMORE, MD.
Regional Sewer System, Planning and Cost Estimation Model,
W73-12357 5G

Outdoor Recreation in the Baltimore Area.
W73-12360 6D

An Evaluation of Baltimore Harbor Land Use Potentials,
W73-12361 6B

REGIONAL SCIENCE RESEARCH INST., PHILADELPHIA, PA.
Stream Quality Preservation Through Planned Urban Development,
W73-12518 5G

RESEARCH TRIANGLE INST., DURHAM, N. C.
Fluidized Bed Clarification as Applied to Wastewater Treatment,
W73-12505 5D

RHODE ISLAND UNIV., KINGSTON. GRADUATE SCHOOL OF OCEANOGRAPHY.
Fouling on Eelgrass (Zostera Marina L.),
W73-12631 5G

ROBERT A. TAFT WATER RESEARCH CENTER, CINCINNATI, OHIO.
Activated Sludge Treatment with Oxygen,
W73-12586 5D

ROBERT S. KERR ENVIRONMENTAL RESEARCH LAB., ADA, OKLA. NATIONAL GROUND WATER RESEARCH PROGRAM.
Ground Water Pollution in the South Central States,
W73-12515 5B

ROHM AND HAAS CO., SPRING HOUSE, PA. RESEARCH DIV. LABS.
Effects of Fertilization on Aquatic Plants, Water and Bottom Sediments,
W73-12661 5C

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Stresses in the Body and Foundations of Prestressed Dams,
W73-12475 8A

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Metabolic Effects of PCB (Polychlorinated Biphenyls) on the Brown Trout (Salmo trutta),
W73-12819 5C

SASKATCHEWAN UNIV., SASKATOON. DEPT. OF BIOLOGY.
Microdistribution and Density as Factors Affecting the Downstream Drift of Mayflies,
W73-12888 2I

SASKATCHEWAN UNIV., SASKATOON. DEPT. OF SOIL SCIENCE.
The Effect of Adsorbents on the Rate of Degradation of Herbicides Incubated with Soil,
W73-12656 5B

SAVANNAH RIVER ECOLOGY LAB., AIKEN, S.C.
Length-Weight Relationship and Condition Factors of Fishes From a South Carolina Reservoir Receiving Thermal Effluent,
W73-12774 5C

SCANDINAVIAN PULP, PAPER AND BOARD TESTING COMMITTEE, STOCKHOLM (SWEDEN).
Settleable Matter in Waste Water. Scan-W7:72.
W73-12530 5A

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF.
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W73-12589 5B

Sea Floor Off Magdalena Delta and Santa Marta Area, Colombia,
W73-12591 2J

Dispersion, Dispersal, and Persistence of the Annual Intertidal Alga, Postelsia Palmeformis Ruprecht,
W73-12883 5C

Estimation of Mortality Coefficients from Field Samples of Zooplankton,
W73-12906 5C

Optical Properties and Color of Lake Tahoe and Crater Lake,
W73-12926 5A

SECONY MOBIL OIL CO., INC., NEW YORK.
Petroleum...40 Years of Research,
W73-12768 3E

SECRETARY OF THE INTERIOR, WASHINGTON, D.C. (ASSIGNEE)
Neutralization of Metal Containing Wastes,
W73-12462 5D

SHOLAPUR COLL. (INDIA). DEPT. OF GEOGRAPHY.
Variability of Rainfall and Agricultural Efficiency of Sholapur District,
W73-12659 3F

SKIDAWAY INST. OF OCEANOGRAPHY, SAVANNAH, GA.
Characteristic Physical and Biogenic Sedimentary Structures in Georgia Estuaries,
W73-12410 2L

Mercury Distribution in Estuarine-Nearshore Environment,
W73-12920 5B

SKIDWAY INST. OF OCEANOGRAPHY, SAVANNAH, GA.
Rearing Channel Catfish Fingerlings Under Intensive Culture Conditions,
W73-12488 8I

SNOWY MOUNTAINS HYDRO-ELECTRIC AUTHORITY, COOMA (AUSTRAILIA).
Large Hydraulic Gates and Valves in the Snowy Mountain Scheme--A Review of Practice,
W73-12476 8C

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Process and Apparatus for Removing Mercury from Waste Water,
W73-12449 5D

SOBOTKA (STEPHEN) AND CO., NEW YORK.
Impact of Costs Associated with New Environmental Standards Upon the Petroleum Refining Industry. Part I. The Impact of Environmental Control Costs.
W73-12708 5G

SOCIETA ITALIANA RESINE S.P.A., MILAN (ITALY). (ASSIGNEE)
Heat-Exchanger for Desalting Sea Water,
W73-12453 3A

SOUTH CAROLINA UNIV., COLUMBIA. DEPT. OF GEOLOGY.
A Topologically Optimum River Sampling Plan for South Carolina,
W73-12498 5B

SOUTH DAKOTA COOPERATIVE WILDLIFE RESEARCH UNIT, BROOKINGS.
Effects of Stress on Pheasants Previously Given Polychlorinated Biphenyls,
W73-12995 5C

SOUTHAMPTON UNIV. (ENGLAND).
Computer Determination of Critical Depth Control Points in Open Channel Flow,
W73-12483 8B

SOUTHAMPTON UNIV. (ENGLAND). DEPT. OF BOTANY.
Water Pathways in Higher Plants: II. Water Pathways in Roots,
W73-12651 2I

Water Pathways in Higher Plants: III. The Transpiration Stream Within Leaves,
W73-12652 2I

SOUTHWEST MINNESOTA STATE COLL., MARSHALL. DEPT. OF BIOLOGY.
Fishes of the Yellow Medicine River in Southwestern Minnesota,
W73-12821 2I

SPARCOM, INC., ALEXANDRIA, VA.
Laser Induced Fluorescence in Algae: A New Technique for Remote Detection,
W73-12841 5A

SRI PRATAP COLL., SRINAGAR (INDIA). DEPT. OF BOTANY.
Botany Along Sonamarg to Trunkhal,
W73-12657 2I

STANDARD OIL CO. OF CALIFORNIA, SAN FRANCISCO.
Sand Control - 3. Chemical Consolidation,
W73-12760 8G

STATE UNIV. COLL., BUFFALO, N.Y. GREAT LAKES LAB.
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W73-12753 2H

Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol II - Biology,
W73-12754 2H

Annotated Bibliography of Lake Ontario Limnological and Related Studies - Vol III - Physical,
W73-12755 2H

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Externalities, Welfare, And the Feasibility of Corrective Taxes,
W73-12694 6B

SWIFT AND CO., OAK BROOK, ILL. RESEARCH AND DEVELOPMENT CENTER.
Factors Influencing Detection of Salmonellae in Rendered Animal By-Products,
W73-12619 5A

SYDNEY UNIV. (AUSTRALIA).
Simplified Calculation of Embankment Deformations,
W73-12473 8D

TECHNICAL UNIV. OF DENMARK, LYNGBY. INST. OF HYDRODYNAMICS AND HYDRAULIC ENGINEERING.
Convective Ground Water Flow,
W73-12722 2F

Ground Water Models With Parallel Linear Reservoirs,
W73-12723 2F

TECHNISCHE UNIVERSITAET, DARMSTADT (WEST GERMANY). WASSER- AND ABWASSERFORSCHUNGSSTELLE.
Investigations on Waste Water Clarification with Activated Carbon (Untersuchungen zur Restabwasserklarung mit Aktivkohle),
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TENNESSEE UNIV., KNOXVILLE.
Fishes of the Big South Fork of the Cumberland River,
W73-12820 4C

TENNESSEE UNIV., KNOXVILLE. DEPT. OF CHEMISTRY.
Voltammetric Study of the Hydrogen Ion/Hydrogen Couple in Acetonitrile/Water Mixtures,
W73-12872 2K

TENNESSEE VALLEY AUTHORITY, MUSCLE SHOALS, ALA. DIV. OF ENVIRONMENTAL RESEARCH AND DEVELOPMENT.
Mussels in the Unique Nickajack Dam Construction Site, Tennessee River, 1965,
W73-12800 2I

TEXACO, INC., BELLAIRE, TEX. BELLAIRE RESEARCH LABS.
Corrosion Monitoring Method Reduces Effect of Variables in Analyzing Oil Field Waters,
W73-12767 8G

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF GEOLOGY.
Long-Lived Pollutants in Sediments From the Laguna Atascosa National Wildlife Refuge, Texas,
W73-12595 5B

TEXAS A AND M UNIV., COLLEGE STATION WATER RESOURCES INST.
Water Quality Hydrology of Lands Receiving Farm Animal Wastes,
W73-12353 5B

Identification of Water Resources Planning Problems in the Metropolitan Area of Greater San Antonio and Its Associated Counties,
W73-12354 6B

TEXAS UNIV., AUSTIN.
Presidio Bolson, Trans-Pecos Texas and Adjacent Mexico: Geology of a Desert Basin Aquifer System,
W73-12585 2F

TEXAS UNIV., AUSTIN. DEPT. OF GEOLOGY.
Black Phytokarst From Hell, Cayman Islands, British West Indies,
W73-12593 2J

TEXAS WATER DEVELOPMENT BOARD, AUSTIN; AND RADIAN CORP., AUSTIN, TEX.
An Investigation of the Nitrate Problem in Runnels County, Texas,
W73-12514 5B

TOKYO METROPOLITAN UNIV., TOKYO. DEPT. OF CHEMISTRY.
Determination of Alkylbenzenesulfonate (ABS) in Bottom Sediment,
W73-12932 5A

TORONTO UNIV. (ONTARIO).
Our Environmental Equilibrium in Nature,
W73-12961 6B

TORONTO UNIV. (ONTARIO). DEPT. OF MECHANICAL ENGINEERING.
Extreme Roughness of Natural River Channel,
W73-12416 8B

TORONTO UNIV. (ONTARIO). DEPT. OF PHYSICS.
On The Number Distribution of Hail Growing in Updrafts,
W73-12602 2B

Dynamics of a Falling Particle Zone,
W73-12603 2B

TORONTO UNIV. (ONTARIO). DEPT. OF ZOOLOGY.
The Characterization of Soluble Phosphorus Released by Limnetic Zooplankton,
W73-12904 5B

TOSHIN INDUSTRIAL MACHINE CO. LTD., OSAKA (JAPAN). (ASSIGNEE)
High-Purity Distilled Water Producing Apparatus,
W73-12450 3A

TURIN UNIV. (ITALY). ISTITUTO DI GEOLOGIA E PALEONTOLOGIA.
Environmental Isotopes and Circulation in Aquifers Under Venice (Isotopes du Milieu et Circulations dans les Aquiferes du Sous-Sol Venitien),
W73-12419 2F

TURKU UNIV. (FINLAND) DEPT. OF BOTANY.
The Physiognomy and Structure of the Benthic Macrophyte Communities on Rocky Shores in the Southwestern Archipelago of Finland (Seili Islands),
W73-12929 5A

UDAIPUR UNIV. (INDIA). COLL. OF AGRICULTURE.
Consumptive Use of Water by Dwarf Wheat in Udaipur Valley,
W73-12387 3F

UNION CARBIDE CORP., SOUTH CHARLESTON, W. VA. CHEMICALS AND PLASTICS.
Identification and Control of Petrochemical Pollutants Inhibitory to Anaerobic Processes,
W73-12513 5D

UNITED STATES STEEL CORP., MONROEVILLE, PA. APPLIED RESEARCH LAB.
Welding of a Normalized High Strength Low Alloy Plate Steel of Structural Quality,
W73-12466 8G

UNIVERSITY COLL. LONDON (ENGLAND). DEPT OF POLITICAL ECONOMY.
Environmental Policy Issues: Real and Fictitious,
W73-12676 6B

UNIVERSITY COLL. OF SWANSEA (WALES). DEPT. OF BOTANY.
Studies on the Growth of Phaeodactylum Tricornutum. II. The Effect of Organic Substances on Growth,
W73-12389 5C

UNIVERSITY COLL. OF WALES, ABERYSTWYTH.
A Note on Stream Ordering,
W73-12735 4A

UNIVERSITY HOSPITAL, LUND (SWEDEN). DEPT. OF OCCUPATIONAL MEDICINE.
Mercury in Fish: Some Toxicological Considerations,
W73-12826 5C

UNIVERSITY OF AGRICULTURAL SCIENCES, BANGALORE (INDIA). DEPT. OF CHEMISTRY AND SOILS.
Soluble Silica and Fluoride in Some Surface and Ground Waters of Mysore State,
W73-12969 2K

UNIVERSITY OF AGRICULTURAL SCIENCES, SIRUGUPPA (INDIA). AGRICULTURAL RESEARCH STATION.
The Quality of Drainage Water from Irrigated Black Cotton Soils for Irrigation,
W73-12650 3F

UNIVERSITY OF MANCHESTER INST. OF SCIENCE AND TECHNOLOGY (ENGLAND). DEPT. OF CHEMICAL ENGINEERING.
Corrosion by the Sulphate-Reducing Bacteria,
W73-12756 5G

UNIVERSITY OF SOUTHERN MISSISSIPPI, HATTIESBURG. BUREAU OF BUSINESS RESEARCH.
Economic and Related Impacts of Rural Water Systems in Mississippi,
W73-12493 6B

UTAH STATE UNIV., LOGAN. DEPT. OF PLANT SCIENCE.
Herbicide Contamination of Surface Runoff Waters,
W73-12511 5B

UTAH WATER RESEARCH LAB., LOGAN.
The Effect of Inorganic Carbon on Eutrophication,
W73-12392 5C

Sediment-Water Nutrient Interchange in Eutrophic Lakes,
W73-12395 5C

A Mathematical Model of the Nutrient Dynamics of Phytoplankton in a Nitrate-Limited Environment,
W73-12915 5C

UTTAR PRADESH IRRIGATION RESEARCH INST., ROORKEE (INDIA).
Rational Design of Well Screens,
W73-12771 8B

VANDERBILT (R. T.) CO., INC., EAST NORWALK, CONN.
Determination of Lead in Petroleum Additives Using Atomic Absorption Spectrophotometry,
W73-12864 5A

VANDERBILT UNIV., NASHVILLE, TENN. DEPT. OF ENVIRONMENTAL AND WATER RESOURCES ENGINEERING.
Total Mercury Analysis: Review and Critique,
W73-12885 5A

VERMONT UNIV., BURLINGTON. DEPT. OF PLANT AND SOIL SCIENCE.
Rapid Field Determination of Nitrate in Natural Waters,
W73-12810 2K

VETERANS ADMINISTRATION HOSPITAL, OMAHA, NEBR.
Optimum Procedure for the Determination of Selenium in Biological Specimens Using Se-77m Neutron Activation,
W73-12876 5A

VIENNA UNIV. (AUSTRIA). ANALYTISCHES INSTITUT.
Determination of Uranium in Urine Specimens Following Their Separation Through Anion Exchange, (Bestimmung Des Urans in Urinproben Nach Dessen Abtrennung Durch Anionenaustausch),
W73-12931 5A

VIRGINIA INST. OF MARINE SCIENCE, GLOUCESTER POINT.
Forecasting Storm-Induced Beach Changes Along Virginia's Ocean Coast,
W73-12584 4A

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. CENTER FOR ENVIRONMENTAL STUDIES; AND VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF BIOLOGY.
The Use of Fish as Sensors in Industrial Waste Lines to Prevent Fish Kills,
W73-12889 5C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF BIOLOGY.
Extension of Range of the Triclad Turbellarian Phagocata Gracilis (Haldeman),
W73-12856 2I

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DIV. OF FORESTRY AND WILDLIFE SCIENCE.
Artificial Reservoir Destratification Effects on Phytoplankton,
W73-12895 5C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. WATER RESOURCES RESEARCH CENTER.
Flood Insurance for Virginia.
W73-12690 6F

VIRGINIA UNIV., CHARLOTTESVILLE. DEPT. OF ENVIRONMENTAL SCIENCES.
Classification of Coastal Environments, Procedures and Guidelines,
W73-12433 2L

Classification of the Coastal Environments of the World: Part II. Africa,
W73-12950 2L

VOLCANI INST. OF AGRICULTURAL RESEARCH, BET-DAGAN (ISRAEL). DIV. OF SOIL PHYSICAL CHEMISTRY.
Sodium-Affected Soils in the Jordan Valley,
W73-12795 2G

VSESOYUZNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT MASLICHNYKH I EFIROMASLICHNYKH KULTUR, KRASNODAR (USSR).
Characteristics of Water Migration in a Thick Leached Chernozem (Osobennosti dvizheniya vody v vyshchelochennom moshchnom chernozeme),
W73-12743 2G

VSESOYUZNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT TSELLYULOZNO-BUMAZHNOI PROMYSHLENNOSTI, LENINGRAD (USSR).
Selection of a Suitable System of Effluent Purification (O vybore ratsional'noi sistemy ochistki stochnykh vod),
W73-12673 5D

VSESOYUZNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT TSELLYULOZNO-BUMAZHNOI PROMYSHLENNOSTI, PRAVDINSKI (USSR).
Determination of Melamine-Formaldehyde Resin in White Waters (Opredelenie soderzhaniya melamino-formaldegidnoi smoly v podsetochnykh vodakh),
W73-12672 5A

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF PLANT PATHOLOGY.
Influence of Water Potential on Growth, Antibiotic Production and Survival of Cephalosporium gramineum,
W73-12999 5B

WASHINGTON STATE UNIV., PULLMAN. NUCLEAR RADIATION CENTER.
Problems in the Analysis of Trace Metals,
W73-12608 5A

WASHINGTON STATE WATER RESEARCH CENTER, PULLMAN.
Physical Characteristics of Basalt Aquifers,
W73-12523 4B

WASHINGTON UNIV., SEATTLE.
Particulate Manganese in Sea Water Stressing Regimes in Marine Anoxic Basins,
W73-12854 5A

WASHINGTON UNIV., SEATTLE. DIV. OF MARINE RESOURCES.
Costs and Profitability in the Commercial Fishing Industry: The Insurance Dilemma,
W73-12699 6B

WATER POLLUTION CONTROL FEDERATION, WASHINGTON, D.C.
WPCF Project Report: A State Certification Program Guide,
W73-12842 5G

WISCONSIN DEPT. OF NATURAL RESOURCES, MADISON.
Mercury Levels in Wisconsin Fish and Wildlife,
W73-12812 5A

WISCONSIN ELECTRIC POWER CO., MILWAUKEE.
An Industrial Point of View-1970,
W73-12965 6B

WISCONSIN STATE UNIV., OSHKOSH. LIMNOLOGY LAB.
The Sediments and History of Lake Butte des Morts, Wisconsin,
W73-12355 2J

WISCONSIN UNIV., MADISON.
Waste Water Treatment in Commercial Fish Processing: Reducing Stick Water Loadings,
W73-12420 5D

Climatic Change and Arrested Meander Development on the River Severn,
W73-12737 4A

Aromatic Hydroxylation as an Analytical Reaction,
W73-12853 5A

WISCONSIN UNIV., MADISON. DEPT. OF CHEMISTRY.
Instrumental and Numerical Considerations for On-Line Interpretation of High Resolution Mass Spectral Data,
W73-12874 2K

WISCONSIN UNIV., MADISON. DEPT. OF SOIL SCIENCE.
Gas Production in Sediments of Lake Mendota, Wisconsin,
W73-12378 5C

The Nitrogen Cycle in Sediment-Water Systems,
W73-12843 5C

WISCONSIN UNIV., MADISON. DEPT. OF SOIL SCIENCES.
Nitrification in Sediments of Selected Wisconsin Lakes,
W73-12763 5C

WISCONSIN UNIV., MADISON. WATER CHEMISTRY PROGRAM.
Nitrogen Release from Lake Sediments,
W73-12860 5B

WISCONSIN UNIV., RIVER FALLS.
Stabilization of Sewage Solids by the Channel Aeration Process,
W73-12502 5D

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
Aspects of the Biogeochemistry of Carbohydrates and Proteins in Aquatic Environments,
W73-12371 5C

Bacterial Content of Particulate Matter in Offshore Surface Waters,
W73-12912 5B

Phytoplankton Algae: Nutrient Concentrations and Growth,
W73-12924 5C

WUERZBURG UNIV. (WEST GERMANY). BOTANISCHES INSTITUT II.
Extreme Water Stress and Photosynthetic Activity of the Desert Plant Artemisia Herba-Alba Asso,
W73-12785 2I

WYOMING AGRICULTURAL EXPERIMENT STATION, LARAMIE.
Public Support of Private Water Resource Development in Agriculture--With Implications for Firm Growth,
W73-12698 4B

WYOMING UNIV., LARAMIE. COLL. OF COMMERCE AND INDUSTRY.
Note on Charges and Bribes in the Long Run within Watersheds,
W73-12702 5G

YALE UNIV., NEW HAVEN, CONN. DEPT. OF GEOLOGY AND GEOPHYSICS.
Trace Element Trapping in Pteropod Tests,
W73-12937 5B

ACCESSION NUMBER INDEX

W73-12351 6A
W73-12352 6A
W73-12353 5B
W73-12354 6B
W73-12355 2J
W73-12356 3D
W73-12357 5G
W73-12358 3D
W73-12359 5G
W73-12360 6D
W73-12361 6B
W73-12362 5G
W73-12363 5G
W73-12364 5G
W73-12365 5G
W73-12366 5D
W73-12367 4C
W73-12368 4A
W73-12369 5D
W73-12370 2H
W73-12371 5C
W73-12372 2L
W73-12373 8I
W73-12374 5C
W73-12375 2L
W73-12376 5C
W73-12377 5C
W73-12378 5C
W73-12379 5C
W73-12380 5G
W73-12381 2B
W73-12382 5C
W73-12383 5A
W73-12384 5C
W73-12385 3F
W73-12386 5C
W73-12387 3F
W73-12388 5C
W73-12389 5C
W73-12390 2L
W73-12391 5C
W73-12392 5C
W73-12393 5C
W73-12394 5C
W73-12395 5C
W73-12396 5C
W73-12397 5C
W73-12398 5C
W73-12399 5C
W73-12400 5C
W73-12401 5C
W73-12402 5C
W73-12403 4D
W73-12404 4D
W73-12405 4D
W73-12406 4D
W73-12407 4D
W73-12408 4D
W73-12409 2J
W73-12410 2L
W73-12411 4C
W73-12412 4B
W73-12413 2H
W73-12414 5B
W73-12415 8B
W73-12416 8B
W73-12417 2L
W73-12418 5B
W73-12419 2F
W73-12420 5D
W73-12421 4B
W73-12422 2L
W73-12423 2C
W73-12424 2L
W73-12425 7C
W73-12426 5A
W73-12427 5G
W73-12428 2L
W73-12429 7B
W73-12430 8B
W73-12431 8F
W73-12432 2A
W73-12433 2L
W73-12434 5D
W73-12435 4A
W73-12436 2G
W73-12437 2G
W73-12438 2G
W73-12439 2F
W73-12440 2E
W73-12441 2G
W73-12442 2D
W73-12443 2G
W73-12444 2G
W73-12445 5D
W73-12446 5D
W73-12447 5D
W73-12448 5G
W73-12449 5D
W73-12450 3A
W73-12451 5D
W73-12452 5D
W73-12453 3A
W73-12454 5D
W73-12455 5D
W73-12456 5G
W73-12457 5D
W73-12458 5D
W73-12459 5D
W73-12460 5D
W73-12461 5D
W73-12462 5D
W73-12463 4D
W73-12464 3F
W73-12465 8A
W73-12466 8G
W73-12467 4A
W73-12468 8E
W73-12469 8C
W73-12470 6B
W73-12471 8A
W73-12472 6B
W73-12473 8D
W73-12474 8B
W73-12475 8A
W73-12476 8C
W73-12477 2G
W73-12478 4A
W73-12479 2J
W73-12480 8C
W73-12481 5D
W73-12482 3F
W73-12483 8B
W73-12484 8D
W73-12485 8C
W73-12486 8C
W73-12487 8C
W73-12488 8I
W73-12489 8G
W73-12490 8E
W73-12491 6B
W73-12492 6B
W73-12493 6B
W73-12494 5D
W73-12495 6B
W73-12496 2A
W73-12497 2D
W73-12498 5B
W73-12499 5A
W73-12500 5D
W73-12501 5D
W73-12502 5D
W73-12503 5D
W73-12504 5D
W73-12505 5D
W73-12506 5B
W73-12507 3F
W73-12508 5G
W73-12509 5G
W73-12510 5G
W73-12511 5B
W73-12512 5D
W73-12513 5D
W73-12514 5B
W73-12515 5B
W73-12516 5G
W73-12517 5D
W73-12518 5G
W73-12519 5E
W73-12520 5D
W73-12521 5D
W73-12522 5D
W73-12523 4B
W73-12524 5D
W73-12525 5A
W73-12526 5G
W73-12527 5A
W73-12528 5D
W73-12529 5D
W73-12530 5A
W73-12531 5D
W73-12532 5A
W73-12533 5D
W73-12534 5D
W73-12535 5D
W73-12536 2B
W73-12537 5D
W73-12538 5G
W73-12539 3F
W73-12540 1B
W73-12541 5D
W73-12542 5D
W73-12543 5D
W73-12544 5D
W73-12545 5D
W73-12546 5D
W73-12547 5G
W73-12548 5G
W73-12549 5G
W73-12550 5G
W73-12551 5D
W73-12552 5D
W73-12553 5D
W73-12554 5A
W73-12555 5C
W73-12556 5D
W73-12557 5D
W73-12558 5D
W73-12559 8B
W73-12560 5E
W73-12561 8B
W73-12562 8B
W73-12563 8B
W73-12564 8B
W73-12565 8B
W73-12566 8B
W73-12567 8B
W73-12568 8B
W73-12569 4A
W73-12570 8B
W73-12571 8A
W73-12572 8B
W73-12573 4A
W73-12574 5G
W73-12575 8B
W73-12576 5E
W73-12577 4A
W73-12578 2F
W73-12579 2F
W73-12580 5G
W73-12581 8B
W73-12582 8A
W73-12583 3F
W73-12584 4A
W73-12585 2F
W73-12586 5D
W73-12587 2B
W73-12588 8B
W73-12589 5B
W73-12590 2J
W73-12591 2J
W73-12592 2J
W73-12593 2J
W73-12594 2J
W73-12595 5B
W73-12596 7C
W73-12597 8B
W73-12598 5G
W73-12599 2B
W73-12600 2G
W73-12601 5A
W73-12602 2B
W73-12603 2B
W73-12604 5B
W73-12605 5B
W73-12606 5B
W73-12607 5C
W73-12608 5A
W73-12609 5B
W73-12610 5G
W73-12611 5C
W73-12612 5C
W73-12613 5C
W73-12614 5C
W73-12615 5B
W73-12616 7B
W73-12617 7B
W73-12618 7B
W73-12619 5A
W73-12620 5A
W73-12621 5B
W73-12622 5B
W73-12623 5A
W73-12624 5C
W73-12625 5C
W73-12626 5C
W73-12627 5C
W73-12628 5C
W73-12629 5A
W73-12630 5A
W73-12631 5G
W73-12632 5A
W73-12633 5C
W73-12634 5C
W73-12635 2J
W73-12636 2G
W73-12637 5C
W73-12638 2G
W73-12639 5C
W73-12640 3F
W73-12641 2H
W73-12642 2H
W73-12643 2I
W73-12644 2I
W73-12645 5A
W73-12646 8I
W73-12647 5C
W73-12648 5C
W73-12649 2H
W73-12650 3F
W73-12651 2I
W73-12652 2I
W73-12653 6A
W73-12654 5G
W73-12655 5A
W73-12656 5B
W73-12657 2I
W73-12658 5C
W73-12659 3F
W73-12660 3F
W73-12661 5C
W73-12662 2I

W73-12663 2H
W73-12664 3F
W73-12665 5C
W73-12666 2I
W73-12667 4A
W73-12668 5D
W73-12669 7B
W73-12670 3F
W73-12671-1 5G
W73-12671-2 5G
W73-12671-3 5G
W73-12672 5A
W73-12673 5D
W73-12674 5E
W73-12675 6B
W73-12676 6B
W73-12677 6B
W73-12678 6B
W73-12679 6B
W73-12680 6B
W73-12681 6B
W73-12682 6B
W73-12683 6B
W73-12684 6B
W73-12685 6B
W73-12686 6B
W73-12687 5G
W73-12688 6B
W73-12689 6B
W73-12690 6F
W73-12691 3F
W73-12692 6B
W73-12693 6B
W73-12694 6B
W73-12695 5G
W73-12696 5G
W73-12697 4A
W73-12698 4B
W73-12699 6B
W73-12700 4A
W73-12701 6B
W73-12702 5G
W73-12703 6C
W73-12704 4A
W73-12705 2L
W73-12706 6B
W73-12707 5G
W73-12708 5G
W73-12709 5G
W73-12710 5G
W73-12711 5G
W73-12712 5B
W73-12713 4C
W73-12714 5B
W73-12715 5B
W73-12716 5B
W73-12717 5B
W73-12718 4B
W73-12719 4B
W73-12720 5A
W73-12721 2G
W73-12722 2F
W73-12723 2F
W73-12724 2H
W73-12725 2H
W73-12726 2C
W73-12727 5A
W73-12728 2L
W73-12729 4A
W73-12730 2K
W73-12731 2J
W73-12732 2J
W73-12733 2K
W73-12734 4A
W73-12735 4A
W73-12736 2E
W73-12737 4A
W73-12738 5G
W73-12739 2L
W73-12740 2L
W73-12741 2H
W73-12742 2K
W73-12743 2G
W73-12744 2G
W73-12745 4B
W73-12746 2K
W73-12747 2G
W73-12748 4A
W73-12749 6B
W73-12750 4A
W73-12751 2K
W73-12752 5G
W73-12753 2H
W73-12754 2H
W73-12755 2H
W73-12756 5G
W73-12757 8G
W73-12758 5G
W73-12759 8B
W73-12760 8G
W73-12761 8G
W73-12762 8B
W73-12763 5C
W73-12764 8B
W73-12765 8G
W73-12766 8F
W73-12767 8G
W73-12768 3E
W73-12769 8E
W73-12770 5B
W73-12771 8B
W73-12772 8G
W73-12773 8B
W73-12774 5C
W73-12775 8G
W73-12776 8G
W73-12777 4B
W73-12778 8I
W73-12779 5E
W73-12780 5E
W73-12781 5E
W73-12782 8G
W73-12783 2F
W73-12784 2I
W73-12785 2I
W73-12786 2G
W73-12787 2I
W73-12788 3F
W73-12789 2G
W73-12790 4A
W73-12791 3B
W73-12792 2I
W73-12793 2I
W73-12794 2G
W73-12795 2G
W73-12796 2I
W73-12797 2G
W73-12798 5C
W73-12799 3F
W73-12800 2I
W73-12801 2D
W73-12802 3F
W73-12803 2H
W73-12804 5B
W73-12805 3F
W73-12806 3F
W73-12807 2G
W73-12808 2G
W73-12809 3C
W73-12810 2K
W73-12811 5A
W73-12812 5A
W73-12813 5C
W73-12814 2I
W73-12815 2I
W73-12816 5F
W73-12817 5D
W73-12818 2G
W73-12819 5C
W73-12820 4C
W73-12821 2I
W73-12822 2D
W73-12823 2I
W73-12824 4A
W73-12825 2L
W73-12826 5C
W73-12827 4A
W73-12828 2I
W73-12829 3F
W73-12830 3F
W73-12831 3F
W73-12832 8I
W73-12833 2K
W73-12834 3F
W73-12835 5C
W73-12836 8I
W73-12837 2I
W73-12838 2I
W73-12839 6A
W73-12840 5G
W73-12841 5A
W73-12842 5G
W73-12843 5C
W73-12844 2I
W73-12845 5C
W73-12846 5C
W73-12847 5B
W73-12848 5A
W73-12849 5A
W73-12850 7A
W73-12851 5A
W73-12852 5A
W73-12853 5A
W73-12854 5A
W73-12855 5C
W73-12856 2I
W73-12857 5C
W73-12858 7B
W73-12859 5C
W73-12860 5B
W73-12861 5C
W73-12862 5B
W73-12863 5C
W73-12864 5A
W73-12865 5A
W73-12866 5A
W73-12867 5F
W73-12868 5A
W73-12869 5C
W73-12870 5B
W73-12871 5A
W73-12872 2K
W73-12873 5A
W73-12874 2K
W73-12875 5A
W73-12876 5A
W73-12877 5A
W73-12878 5C
W73-12879 5A
W73-12880 5A
W73-12881 5C
W73-12882 5C
W73-12883 5C
W73-12884 3F
W73-12885 5A
W73-12886 5A
W73-12887 5A
W73-12888 2I
W73-12889 5C
W73-12890 5D
W73-12891 7C
W73-12892 7C
W73-12893 7C
W73-12894 5B
W73-12895 5C
W73-12896 5C
W73-12897 5C
W73-12898 5B
W73-12899 8I
W73-12900 2I
W73-12901 5A
W73-12902 2I
W73-12903 5C
W73-12904 5B
W73-12905 5B
W73-12906 5C
W73-12907 5A
W73-12908 5A
W73-12909 5C
W73-12910 5A
W73-12911 5A
W73-12912 5B
W73-12913 5C
W73-12914 5D
W73-12915 5C
W73-12916 5A
W73-12917 5C
W73-12918 5C
W73-12919 5C
W73-12920 5B
W73-12921 8I
W73-12922 5B
W73-12923 2I
W73-12924 5C
W73-12925 5A
W73-12926 5A
W73-12927 5A
W73-12928 5C
W73-12929 5A
W73-12930 5A
W73-12931 5A
W73-12932 5A
W73-12933 4A
W73-12934 2H
W73-12935 5A
W73-12936 5B
W73-12937 5B
W73-12938 5B
W73-12939 2G
W73-12940 5B
W73-12941 2F
W73-12942 2A
W73-12943 4B
W73-12944 4B
W73-12945 5B
W73-12946 4A
W73-12947 4B
W73-12948 2L
W73-12949 2E
W73-12950 2L
W73-12951 5C
W73-12952 5C
W73-12953 2A
W73-12954 2A
W73-12955 5G
W73-12956 2J
W73-12957 2J
W73-12958 5B
W73-12959 5B
W73-12960 6B
W73-12961 6B
W73-12962 5C
W73-12963 6B
W73-12964 6B
W73-12965 6B
W73-12966 3F
W73-12967 2G
W73-12968 2G
W73-12969 2K
W73-12970 5C
W73-12971 2I
W73-12972 2I
W73-12973 5C
W73-12974 4A
W73-12975 3F
W73-12976 5A

W73-12977 3F
W73-12978 2H
W73-12979 2G
W73-12980 2I
W73-12981 3F
W73-12982 5C
W73-12983 2B
W73-12984 2I
W73-12985 3F
W73-12986 2I
W73-12987 2I
W73-12988 3F
W73-12989 3F
W73-12990 5G
W73-12991 5B
W73-12992 2D
W73-12993 2D
W73-12994 2D
W73-12995 5C
W73-12996 5B
W73-12997 5C
W73-12998 8I
W73-12999 5B
W73-13000 5C

ABSTRACT SOURCES

Source	Accession Number	Total
A. Centers of Competence		
Battelle Memorial Institute, Methods for Chemical and Biological Identification of Pollutants	W73-12616 -- 12631 12841 -- 12843 12845 -- 12855 12857 -- 12862 12864 -- 12883 12885 -- 12887 12889 -- 12913 12915 -- 12920 12922 12924 -- 12932 12935 -- 12938	104
Bureau of Reclamation, Engineering Works	W73-12463 -- 12487 12489 -- 12490	27
Cornell University, Policy Models for Water Resources Systems	W73-12711 12839 -- 12840	3
Institute of Paper Chemistry, Water Resources of Pulp and Paper Industry	W73-12524 -- 12538 12540 -- 12558 12672 -- 12674	37
National Water Well Association, Water Well Construction Technology	W73-12756 -- 12762 12764 -- 12773 12775 -- 12777 12779 -- 12783	25
University of Arizona, Arid Land Water Resources	W73-12403 -- 12408 12785 -- 12797	19
University of North Carolina, Metropolitan Water Resources Planning and Management	W73-12356 -- 12369	14
University of Wisconsin, Eutrophication	W73-12371, 11374 12376 -- 12377 12379 -- 12380 12383 -- 12384 12386 12388 -- 12389 12391 -- 12402 12712	24
University of Wisconsin, Water Resources Economics	W73-12675 -- 12699 12701 -- 12704 12706 -- 12710	34
U.S. Geological Survey, Hydrology	W73-12409 -- 12444 12574 -- 12582 12584 -- 12614 12713 -- 12720 12722 -- 12726 12728 -- 12737 12739 -- 12752 12940 -- 12965	139

ABSTRACT SOURCES

Source	Accession Number	Total
B. State Water Resources Research Institutes		
Colorado Environmental Resources Center	W73-12507 -- 12510	4
Hawaii Water Resources Research Center	W73-12499	1
Mississippi Water Resources Research Institute	W73-12492 -- 12495	4
Nebraska Water Resources Research Institute	W73-12496, 12615	2
New Mexico Water Resources Research Institute	W73-12497	1
South Carolina Water Resources Research Institute	W73-12498	1
Texas Water Resources Institute	W73-12353 -- 12354	2
Washington Water Research Center	W73-12523	1
Wisconsin Water Resources Center	W73-12355	1
C. Other		
Army Coastal Engineering Research Center	W73-12559 -- 12573	15
BioSciences Information Service	W73-12370 12372 -- 12373 12375, 12378 12381 -- 12382 12385, 12387 12390, 12488 12539, 12583 12632 -- 12670 12700, 12705 12721, 12727 12738, 12763 12774, 12778 12784 12798 -- 12838 12844, 12856 12863, 12884 12888, 12914 12921, 12923 12933 -- 12934 12939 12966 -- 13000	148
Environmental Protection Agency	W73-12500 -- 12506 12511 -- 12522 12671 12753 -- 12755	23
Ocean Engineering Information Service	W73-12445 -- 12462	18
Office of Water Resources Research	W73-12351 -- 12352 12491	3

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

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10 SCIENTIFIC AND TECHNICAL INFORMATION

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